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No. 336

China Addresses Pollution Problems

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PAPERS ON ENVIRONMENTAL MANAGEMENT, ECONOMICS PUBLISHED

Preface to Publication

Taiyuan LUN HUANJING GUANLI [ON ENVIRONMENTAL MANAGEMENT] in Chinese, First Edition Jul 80, First Printing Feb 81, pp 1-2

[Preface by Chen Xiping [7115 6006 1627], president of the China Environmental Management, Economics and Law Society, May 1980. "Editor's Note: Comrade Chen Xiping is also deputy director of the Environmental Protection Leading Group Staff Office in the State Council and vice president of the China Environmental Sciences Society"]

[Text] This publication, ON ENVIRONMENTAL MANAGEMENT, is a collection of 21 papers presented at the February 1980 National Symposium on Environmental Management, Economics and Law. It is the first collection of papers on environmental management published in China and should play an important role in the development of environmental work.

Research on environmental management as a science has just begun and the publication of this book is a beginning, with the hope that it will draw the attention of researchers, educators and environmental management workers to the importance of this topic, and that they will actively develop the study of environmental management, promote rapid progress in this new field and contribute to the improvement of environmental quality.

The environmental issue is in essence an economic one. Since the environment is a resource and an important factor of productivity, environmental pollution and ecological destruction represent new problems accompanying the development of production, and they interact with economic development. The only way to solve the environmental problem is to combine it with production and view the economy and the environment as two aspects of the same entity in the course of developing production, so that they may enjoy coordinated development. In other words, China's environmental protection problems should be solved in accordance with the basic economic principles of socialism and on the basis of the actual situation in China, and this should be carried out in a planned manner in keeping with the principle of proportion. There are a great many social science issues that we have solved by combining theory and practice. Today, many problems if environmental management, environmental economics, and environmental law require urgent study: the status and function of environmental protection in national economic development; the goals of environmental protection planning and the system and methodology for planning indicators; the economic benefits of environmental protection and environment-related economic policies; environmental management systems, including planning systems, organizational systems, management methods and responsibility systems; the theory and framework of environmental protection legislation; judicial organization for carrying out environmental protection laws, mediation systems, and monitoring systems; and the use of executive, economic, legal and educational means in environmental management. Obviously, investigation of these problems means a lot to the success of China's environmental protection and to promotion of socialist modernization construction as well. Following the basic principles of Marxism and consolidating our own practical experiences, we should conduct in-depth studies and, in the meantime, learn and use for reference the useful things of other nations. Then, based on the situation in China, we will create environmental social science disciplines based on the characteristics of China.

ON ENVIRONMENTAL MANAGEMENT is the first collection of papers published by the China Environmental Management, Economics and Law Society. Vice President Liu Wen [0491 2429] of the Society and Lin Daolian [2651 6670 3425], Peng Tianjie [1756 1131 2638] and Chen Dongsheng [7115 2767 3932] on the editorial staff handled the editing. In the spirit of the "double-hundred" policy and the principle of academic freedom, we have included papers with different academic viewpoints. Many problems are still awaiting a general discussion and in-depth study. With the publication of this book, I hope many more articles and books will be published.

Extent of Environmental Problem Termed 'Grave'

Taiyuan LUN HUANJING GUANLI [ON ENVIRONMENTAL MANAGEMENT] in Chinese, First Edition Jul 80, First Printing Feb 81, pp 1-40

[Article by Yu Guangyuan [0060 0342 6678], vice minister of the State Scientific and Technological Commission and adviser to the China Environmental Management, Economics and Law Society: "Environmental Problems, Environmental Work and Environmental Science"]

[Excerpts] There is a certain realm in the life of our society regarding which the cadres and people of our nation are beginning to be aware of the problems, but on the whole the understanding is far from adequate; some work has begun in this realm, but these efforts do not come close to meeting the objective needs; some institutions are beginning to be established, but the organizations are very incomplete; we are beginning to have some specialists in this realm, but a powerful team is yet to be formed. The realm I am referring to is the environment. I wish to express some rudimentary opinions on the three aspects of the environment: environmental problems, environmental work, and environmental science.

I. Environmental Problems

In Part I, I will discuss environmental problems on the basis of six points:
1) What is the environment and what do we understand it to mean today?
2) What are the environmental problems? 3) The history of environmental problems.

4) Why are environmental problems receiving so much worldwide attention today and how have the problems come about in the last 20 years? 5) Interrelationship of environmental problems, people's awareness of the problems, and the social system. 6) What are the environmental problems in China today, what is the current status of China's environmental problems, and what has led to China's serious environmental problems?

The term "environment" is always used relative to some main organism, which has its own internal world as well as an external world surrounding it. The external world which has more than minimal or negligible effects on the main organism, surrounds it and acts on it, constitutes the "environment" of the main organism. The environment in our discussion surrounds the main organism of human society. For example, the entire earth -- in particular, the atmosphere, the hydrosphere, the soil and lithosphere and the biosphere on the surface of the earth -- is the environment in which the human race exists and develops.

Point 6 above deals with today's environmental problems in China. What is the nature of China's current environmental problems? Up to now, China's industry and agriculture have not been developed to the 1960's level of the world's industrially developed nations. However, the environmental problems in China have reached a very serious degree, that is, serious pollution problems already exist in China. When the Japanese exposed environmental pollution in their country in the 1960's, we did not have this awareness. In China the environmental pollution problem was gradually realized later, and by the time we became aware of the problem, pollution of the environment was already very serious. Environmental pollution in China is, of course, related to the industrial construction since the revolution, but it is not entirely proportionate to the development of production. The aggravation of environmental pollution has been more rapid than the development of industrial and agricultural production, and furthermore, during the rampages of the "gang of four," production dropped and yet environmental pollution increased rapidly. In 1976, just before the "gang of four" was crushed, China's national economy was on the verge of collapse, but environmental pollution was more serious than ever. One can see the following trend: the more destruction and chaos in the national economy, the more serious the environmental pollution. Environmental pollution in capitalist countries is naturally related to their capitalist system and to the fact that capitalists are only after profit, that profit is their only concern. In China, we should have done better. If we had known about environmental protection and if we had paid attention to the problem from the very beginning, it would not have deteriorated to the present grave state. In addition, with the 9.6 million square kilometers of land in China, how can this little bit of industry cause such serious environmental damage? Our environmental problem is admittedly related to our industrial development, but for such a meager industry to cause such serious pollution is to a large extent due to subjective causes.

Of course, the subjective causes we are referring to here are not entirely because we did not do a good job. Comrade Xue Baoding [5641 5508 7844] once said that he handled 50 of the 156 projects during the first 5-year plan. In these 50 construction projects, attention was rarely paid to environmental protection measures, and very poor measures they were, if any. This is not unusual, as in the early 1950's there was not yet sufficient awareness of environmental problems; the question had not yet been raised with any seriousness. But later, for a long period of time, we lacked awareness of these problems, and that is the reason for today's grim situation. Now the environmental problems in China are getting worse -- we note in particular the serious pollution in Songhuajiang -- but still no forceful measures are being taken. In China many pollution problems which are clear-cut from an environmental protection viewpoint have long been ignored. Take production layout. Many plants that discharge poisonous sewage just had to be built upstream of rivers, of all places, and it took only a few plants to pollute an entire river. In one city, several chemical plants just happened to "hook up with" water supply plants of all things. Having a chemical plant and a water supply plant side by side, the water source becomes badly polluted. Plants emitting poisonous gas just had to be built in densely populated major cities, even in Beijing, the capital. As far as capital construction goes, there was a long period when neither environmental protection nor treatment of the "three wastes" were given serious consideration during design and construction. Even after the environmental protection issue was raised, some people still paid no attention. There were those who only viewed the problem from the production point of view and even claimed that environmental protection was a burden and avoided environmental measures wherever possible. As a result, the environmental situation in China kept deteriorating, even after the discovery that the environment in China was badly polluted. Here we have only discussed industrial pollution; if forest damage and ecological damage are also included, the problem is even more serious. Erosion and soil water loss in the loess plateau area in Northwest China did not begin just in the past 10 years, and it continues to exist. However, forest depletion in the Southwest and in the Northeast are things which developed over the past 30 years. Due to the serious depletion of forests in the Southwest, many people now believe that without forceful measures to alter the trend, the Chang Jiang will eventually run the risk of becoming another Huang He. Some are also concerned that the Southwest may become an arid land like Northwest China is today; the land of paradise [Sichuan Province] may turn into a poor land, and the lower reaches of the Chang Jiang may no longer be the country of rice and fish. Large-scale reclamation, if not preceeded by detailed studies of ecological equilibrium and conducted with prudence, could also lead to undesirable results.

In China the environmental problem includes not only industrial pollution but also other problems such as forest depletion. This is one aspect that puts China at even more of a disadvantage compared with Western Europe and North America. In the 1920's, cultivation and reclamation of wasteland in the United States led to serious drought and the occurrence of dust storms; that practice was later corrected with great effort. Today, forest protection is closely observed in Western Europe, North America and Japan, but not in China.

On the one hand, environmental problems and pollution are the products of modern industry, but on the other hand, they are also the products of the underdevelopment of modern industry. This is because a well-developed modern industry and advance environmental protection will alleviate the environmental problems. In this respect, we are handicapped by the lack of adequate material and technology to solve the environmental problems.

Finally, I wish to discuss one more point -- let it be point 7. As long as people live in the world and carry out various production and other social activities to obtain material needed in their lives, it is impossible to avoid pollution completely. This is because living produces waste and production produces waste; it would be impossible to live and to produce if pollution were to be absolutely avoided. In other words, pollution is inevitable. Of course, pollution is not something we desire, but since it is inevitable, it can be considered a necessity. This is like the fact that one must have some ailment in one's life, and sometimes even a few serious illnesses cannot be avoided. Sicknesses are inevitable. The environmental problem is in the same situation. Absolute avoidance of pollution is impossible, but it is entirely possible to greatly reduce pollution and disruption of the environment and to transform many cases of pollution into positive factors. Once the environment has been polluted and damaged, efforts can be made to restore it, but this is more difficult. The notion of requiring absolutely no pollution is metaphysical, and we are realists; when urgent needs must produce pollution, we can live with this pollution. When one is in a war, for instance, can one still ask how much pollution a falling bomb will produce? The answer is no. In 1942 and 1943, a major production effort was made in Yan'an. Wasteland was cultivated for crop planting, hill after hill was turned into cropland, and substantial damage was done to the forests. At that time no one knew what environmental science was, it was just considered a shame, but it was thought that it was due to the pressing needs of war and there was no way around it. But now we are not at war and we do not have a warlike pressing situation. We are now engaged in long-term socialist construction, so we should consider environmental problems on the fundamental basis of long-term socialist construction and give environment an important status. When we talk about socialist construction, we cannot avoid the objectives of socialist production and the goal of the socialist economy. The goal of the socialist economy is to improve people's lives and to satisfy the people's needs for their livelihood to the maximum possible extent. All our economic activities and production activities are aimed at this goal. We must not jeopardize people's lives in the environmental area in order to produce goods that satisfy the people's needs. The reason is obvious: disregarding the environment and looking only at production is not consistent with the objectives of the socialist economy. When we undertake construction, we are thinking of the long term, not just the immediate interests; we are considering people's long-term interests and the interests of generations to come. We must not jeopardize the fundamental interest for the sake of current interest. We must treat the environmental problem on the basis of long-term socialist construction.

II. Environmental Work

I use the term "environmental work" because it involves more than environmental protection. It includes creating a micro environment, improving the macro environment and maintaining a favorable environment. Prevention of pollution and management of a damaged environment are only parts of the environmental task. It should be pointed out, however, that the most urgent task today is environmental protection. Any task has a definitive goal and is conducted for a specific circumstance, and environmental work is no exception. So what is the circumstance? For China the most conspicuous problem is pollution, that is, the destruction of desirable environment. The emphasis of our work should therefore be placed on the most urgent problem. Even though environmental work has many facets, the emphasis should be made clear. What is the condition of our environment? It has been said that some people are keeping the pollution situation secret, mostly from foreigners, for fear of embarrassment. Comrade Wang Jianmin [3769 0256 3046], in sending me some material, said that pollution of the atmosphere, ocean and surface water and problems of traffic, sanitation, social order and housing are very difficult to keep secret because anybody can see them. Pollution of underground water also shows up as increased water hardness and deposits in boiled water; how can they be kept secret? Besides, we are now also introducing foreign capital and foreign technology and asking foreigners to modify our old plants. They can see things very clearly; how can secrets be kept? An American delegation came to Beijing and brought a particle detector. They made some measurements at Tiananmen Square and everything showed up. Measurements made in a class room at the Institute of Environmental Chemistry of the Chinese Academy of Sciences showed that the measured results exceeded the level permitted by U.S. environmental standards by several times. I went to Japan last year, and there also I found it is exceedingly difficult to keep secrets from foreign visitors. The former president of Tokyo University, Ito Ichiro, came to China to investigate environmental pollution. He is a law expert and is doing research on environmental law. He asked me where he should go to see pollution and I said -- I had to be honest with him -- you can see it wherever you go. Our environmental pollution is that serious, and that is the truth. After all, they are the experts and they cannot be fooled. I don't think it is a good idea to keep the environmental pollution situation from the public. Whether the environmental situation is good or bad, it should be made known to the people. The causes of environmental problems should also be made known to the people so that the public can make correct analyses. In order to do a good job of environmental protection, not only do we have to work hard, but we should also get the public's attention and have everyone work together. Our enterprises and our government naturally are responsible for some causes of pollution, and the public should also share the responsibility. For example, because the traffic is bad in the cities, automobile drivers have to beep their horns, which in turn makes the noise even worse. I have seen the following data in the Environmental Protection Office: the traffic noise intensities in downtown Beijing, Shanghai, Tianjin, Nanjing, Hangzhou, Wuhan, Guangzhou, Chongqing, and Harbin are all above 80 decibels, much worse than the traffic noise in London, New York or Tokyo. There are more than 2 million automobiles in Tokyo; do we have that many in Beijing? Beijing has only 140,000 automobiles, and yet the noise in Beijing is 9 decibels higher than that in Tokyo. This also goes to prove the point I made earlier, that many types of pollution in China are not proportionate to the degree of production development. For Beijing, after all, there are 140,000 automobiles, whereas Hangzhou has only a few thousand automobiles, but the noise in Hangzhou is also worse than in Tokyo. Granted, automobiles are not the only source of traffic noise, but they are probably the primary source. Here we have to ask what causes the poor traffic conditions; doesn't poor traffic involve the problem of the public's attention to traffic regulations? Here we also have a habit problem, and we cannot reduce traffic noise without educating the public. Of course, there are certain backgrounds leading to the situation we have now, such as the large number of bicycles and pedestrians. Tokyo has numerous subway routes, but no public transportation vehicles such as buses or electric cars above ground. All the public transit vehicles are underground, and there are only taxis on the street. We do not yet have the means to do this in Beijing, but a major effort to improve the traffic can still reduce the noise level greatly.

Comrade Li Chaobo [2621 6389 0130] has mentioned some data, and I wish to repeat it here to underline the necessity of environmental work. Although the pollution of our environment is beginning to receive attention, it still goes on. The waste gas emitted in 1979 was 5.6 percent higher than that in 1978 and 18 percent higher than that in 1977; for waste water, the figures are 8 percent higher than 1978 and 22 percent higher than 1977; for waste residue, 3.6 percent higher than 1978 and 12 percent higher than the 1977 level. According to statistical data taken in 62 cities, 17 of them have a sulfur dioxide level above the national permitted level. Out of 87 rivers, 54 contain at least two hazardous material pollutants and 14 are seriously polluted. The area of erosion and soil water loss has now reached 1.5 million square kilometers, that is, one-sixth of the area of China. Five billion tons of soil have been washed away, along with 400,000 tons of nitrogen-phosphate-potassium fertilizer, equivalent to the total annual production of chemical fertilizer in the entire country. In 30 years, 60,000 square kilometers of land have turned into desert. The ground water level is dropping in the cities; in Shenyang, Beijing and Jinan, the rate is 0.5 meter to 1 meter per year. If this continues, the people of Shenyang are concerned that their ground water may be depleted in 20 years. In my opinion, in view of these statistics, the immediate task of environmental protection is to reverse the trend of deterioration as quickly as possible. I don't know if you agree with me. Based on our present ability, we probably cannot achieve goals set too high, but we should make every effort so that the environment will not continue to deteriorate. How about the following request: even though we cannot pay all of our old debts, at least let us borrow no more money. Do you think we can do that? It seems to me that if we do a good job, we can not only stop borrowing money but we can also pay off some of our old debts. When I was in Taiyuan I was told that comrades at the Taiyuan Steel Company had made an environmental protection effort and had gotten rid of the "red dragon" at Taiyuan Steel. In recent years, the nation has been paying more attention to the environment and has obtained substantial results. But the achievements are not significant enough, not to the point that the deterioration trend can be stopped on a nationwide scale. Not being able to halt the trend of deterioration is like generating new debts while old debts are standing and, as debts pile up, they can never be paid off.

III. Environmental Science

The content of environmental science is rather broad. The Environmental Society now has 14 speciality groups. Environmental economics, environmental management and environmental law constitute one of the groups. On the basis of these speciality groups, study groups and societies have been established. The 13 other groups include theoretical work on the "three wastes," noise, and a host of other problems, almost entirely in the area of natural science and technological science. In the social science area, only the three mentioned above were originally planned. I do not think they are the only environmental social sciences. For instance, I believe there should be an "environmental sociology" among environmental sciences. The content of environmental sociology, in my opinion, should be primarily the study of social problems caused by environmental problems and the relationship between environment and social development. There would be other topics of study in environmental sociology, but I think these two are of special importance. Sociology was negated in the 1950's, and that was a mistake. Now this discipline has been reaffirmed. The China Sociology Society has already been established, the Chinese Academy of Social Sciences has also organized a preparatory group to arrange the establishment of an institute of sociology. Environmental problems should be a subject of study in sociology; in foreign countries, environmental sociology has already been established. We should conduct systematic study of the social problems caused by the environment and investigate to what extent environmental pollution has affected people's health. Earlier we discussed the problem of poisonous gas and dust in the atmosphere; standards of permissible level are determined on the basis of medical science research; the environmental testing branch has carried out observations and measured the actual contents. On this basis, environmental sociologists can then study the effects on people living in such an environment, the rates of sickness and disease due to various causes, and their variations and regularity. Environmental sociology should also investigate the effects of pollution on residents' family life and sociological psychology. Environmental pollution causes many social problems, some very conspicuous and acute. I learned from one source that fights have broken out in a number of places because of environmental problems. In Shanghai, some alley factories produce tremendous noise day and night, and the neighbors cannot stand it. The odor of spray paint from some plants is unbearable, and causes respiratory diseases in residents living nearby. There were numerous complaints, but solutions were never found. Finally, people resorted to violence. Environmental sociologists should also study such conflicts and sort out the consequences of pollution and what we should do in environmental work. Through the scientific investigation of environmental sociology, the status of environmental problems can be understood more thoroughly, more emphasis can be placed on the environment, and locations with acute environmental problems can be identified in order to promote an earlier resolution of the problem. The study of environmental sociology would help us in accurately and forcefully publicizing the problem.

Ways To Strengthen Research

Taiyuan LUN HUANJING GUANLI [ON ENVIRONMENTAL MANAGEMENT] in Chinese, First Edition Jul 80, First Printing Feb 81, pp 41-51

[Article by Li Chaobo [2621 6389 0130], director of the Environmental Protection Office, Environmental Protection Leading Group, State Council, and president of the China Environmental Sciences Society: "Strive for an Improved Environmental Management Standard in China"]

[Excerpts] From experience we have increasingly realized that environmental management, environmental economics and environmental law are the important components of environmental science and that they are major scientific bases for good environmental work. Today, we must quickly organize academic talent in these areas, form teams of specialists, speed up the pace of scientific research and contribute to the improvement of China's environment.

In this article we present a brief introduction to the current situation of China's environment and some preliminary views on how to strengthen scientific research on environmental management, environmental economics and environmental law.

I. China's Environmental Situation

The party and government of China pay great attention to environmental protection work. In late 1978, the emphasis of the party's work was shifted to socialist modernization construction, and with the new focus on national economic readjustment, restructure, consolidation and improvement, the Party Central Committee approved and transmitted the document "Essentials of Reports on Environmental Protection Work." In September 1979, the Fifth National Congress Standing Committee issued the "(Provisional) Environmental Protection Act of the People's Republic of China." These two important documents combined the historical experience and lessons in China's development of environmental protection, prescribed policies and measures for China's environmental protection, and marked the beginning of a new era in China's work on environmental protection.

For over a year, various regions and departments in China have strived to carry out these two important documents, made new progress on environmental protection and created a new atmosphere:

1. Environmental problems continue to receive the leadership's attention. Leading comrades in many provinces and municipalities are taking the lead in publicizing environmental protection by looking into the problems in person, frequently checking the work, and urging industrial and mining enterprises to control their pollution. Many of the industrial and agricultural departments are paying attention to environmental protection while they move ahead on production construction. Some of the serious polluting enterprises have reduced their emission of the "three wastes" by combining pollution control with the drive to boost production, reduce spending, develop potential, and restructure and strengthen business management. Municipalities and water zones have made progress in treating pollution in varying degrees.

2. Because the vast population has increasingly realized the importance of environmental protection, their growing concern and strong pleas have furthered the progress of environmental protection work.

3. The question of across-the-board management of the environment has been put on the agenda. Environmental protection has gradually progressed from simple pollution treatment to the prevention of environmental pollution and of ecological destruction by a combination of economic, legislative, administrative and educational methods. The development of environmental management is an important step in environmental protection. Many provinces and municipalities have established such systems as assessment of the "three simultaneous," issuance of smoke and dust elimination certificates, and control of poisonous material supply, and have obtained good results in pollution prevention and treatment. Some cities have tried economic measures such as collecting pollution fees and fines, and are beginning to see the effects.

4. Environmental management institutions and environmental monitoring and research have been strengthened. International cooperation and exchange activities are on the rise.

5. Environmental protection policies have been further strengthened, and the work of publicizing scientific knowledge has been stepped up. More and more reports are appearing in the newspapers, on the radio and in magazines, effectively publicizing and promoting environmental protection.

All this shows that prospects for China's environmental protection are very good and getting better. But on the whole, pollution of the environment and harm to the natural resources are not yet under control, and in local areas they may even be getting worse. The main evidence is the continued rise in the amount of waste dumped into the environment by industries and by city residents. The inevitable end result is undoubtedly the continued deterioration of the environmental quality of cities and waters. In today's China the disruption of the natural environment and ecological balance are even more serious problems than industrial pollution. According to initial surveys, 1.6 billion tons of mud and sand are washed into the middle reaches of the Huang He every year, causing the riverbed to rise at a rate of 3 inches per year. China did not have large forests to begin with; now the coverage rate is only 12.7 percent, which is 120th among nations of the world. Unplanned logging and destruction of forests due to reclamation and forest fires have brought a series of bad results, such as changes in climate, soil and water loss, and aggravation of flood and drought. There are also serious problems regarding water resources: in addition to the pollution from industrial and residential emissions, deployable water resources have continually decreased due to the blind making of land from lakes and excessive use of ground water.

Pollution of the environment and destruction of natural resources not only affect people's everyday lives but also hinder the growth of production. Disproportions in the national economy can be readjusted with a few years' determined effort. But once the environment is polluted, and especially when the ecological balance is upset, it takes several decades or even 100 years to restore it, if restoration is possible at all. Therefore, in order to realize the four modernizations, great attention should be placed on environmental protection.

II. Solving Environmental Problems During the Rapid Development of Production

Today China is going all out for socialist modernization construction. The mission of modernization is multifaceted and requires a general balance of all aspects. We should not stress one area and neglect other areas. In the past we learned the lesson of disproportionality, and now we must correct the error. Pollution of our environment and damage to our natural resources are also caused by unbalanced development of production and lack of environmental protection. Today, there are almost 400,000 enterprises in China, and they are the bases on which we are striving toward the great goal of the four modernizations. At the same time, for reasons involving knowledge, experience, economic ability and scientific technology, the great majority of these 400,000 enterprises do not have environmental protection facilities and have become the principal sources of pollution in China. China is a vast land with abundant resources, but for a long time we have concentrated on development and deployment and have failed to value and protect these resources. This has led to many problems. As we all know, most of the developed nations in the world have taken the tortuous route of developing first and managing later, and they have paid the heavy price of sacrificing their environment. Can we avoid this tortuous route? I think so. First, we have a superior socialist system, the people's system, and the goal of production development is to improve people's lives. The purpose of our production development is in total agreement with our goal of environmental protection. Second, we have a planned economy, which allows us to coordinate the development in different areas through overall balance, and environmental protection is entirely compatible with other areas of economic endeavors. Third, a lot of experience and examples have been accumulated, both here and abroad, to guide us. Under the leadership of the party and the government and with the concerted efforts of all the people, we can definitely avoid that tortuous route, or turn back from it before we have gone very far.

III. Getting Organized and Working for Improvement of Environmental Management, Environmental Economics and Environmental Legislation Standards

The 1980's is a key period in our socialist modernization; it is also a key period for China's environmental work. In carrying out our Chinese-style modernization, we should combine production with environmental protection. In the 1980's there will be major developments in various construction enterprises in China, and environmental problems will also become more and more prominent and important. If we can get a grip on environmental work in this decade, we will be laying a firm foundation for solving the environmental problems in China. If we cannot get a grip on the problem in this decade, we will probably take the tortuous road of construction first and pollution management later. If we are to do a good job of environmental protection, we must work hard to improve the scientific level of environmental protection and do everything according to the rules of science. Environmental management, environmental economics and environmental law are brand new disciplines in China, and their research strength is still weak; great efforts must be made to obtain some research results quickly.

Scientific research should be developed by bringing all positive factors into play. To begin with, environmental protection branches at various levels must strengthen their research. An environmental protection management worker should not only have a knowledge of natural science, but more importantly, must also possess a knowledge of social science regarding environmental management, environmental economics and environmental law. We hope that all the comrades in the environmental protection departments at various levels will study environmental social sciences in conjunction with their own tasks and become experts in one or more disciplines. In the meantime, some training classes and study sessions could also be organized. Thus, the standard of our work could be greatly improved.

Professional research organizations for environmental protection should broaden their study of environmental social sciences. At the moment, most of the environmental research organizations already established or being instituted in China are for the study of pollution management and monitoring and analysis technology; investigation of environmental social sciences should be strengthened. Division of labor and preferential emphasis should be considered; for instance, at some research institutions environmental technology policy and comprehensive pollution prevention technology may be emphasized, and at other institutions studies of environmental economics and environmental management may be emphasized. The environmental research organizations in various industries, while investigating pollution management technology, may also develop some research on environmental management, economy and law so that technology and economy can be combined. In short, the research effort in this area should be strengthened.

The resource of colleges, universities and research departments should be developed to the fullest. They provide an enormous resource. It is fair to say that environmental social science research was started by experts and scholars in these departments, and they have achieved encouraging results. We hope that colleges and research units will continue to develop and improve their research on environmental problems and achieve even greater results.

Publicity, education and academic exchange should be broadly conducted. The popularization of environmental education is extremely urgent and essential. A science must be mastered by the masses before it can become a great material force. Environmental protection involves thousands of households and all walks of life, so the popularization of environmental science knowledge is particularly important. Recently, newspapers, radio stations and magazines have increased their coverage on environmental protection. This is a good sign. I would like to see more publicity, so that it can gradually become known to every family and individual. In the meantime, we should embark on various means to activate academic exchange.

Environmental protection is a very important undertaking; we must work together to strive for a rapid improvement of the scientific level of environmental management, environmental economics and environmental law in China.

Development of Environmental Science

Taiyuan LUN HUANJING GUANLI [ON ENVIRONMENTAL MANAGEMENT] in Chinese, First Edition Jul 80, First Printing Feb 81, pp 52-62

[Article by Xue Baoding [5641 5508 7844], deputy director of the Industrial Economics Institute of the Chinese Academy of Social Sciences and adviser to the China Environmental Management, Economics and Law Society: "Develop Research on Environmental Management, Economics and Law"]

[Excerpt] I. Historical Background of the Development of Environmental Science

China is a socialist country in which not only production should be developed, but the environment should be protected and improved as well. The environmental protection workers of China must strive to improve the scientific standard of environmental economics, management and law. All these are manifestations of the necessity to handle properly the relationship with the natural environment in the economic development of mankind. In other words, only when the laws of nature, the laws of technological development and the laws of social economics are recognized and followed can we protect the production environment and the living environment of mankind scientifically and rationally and insure that mankind can continue to live in this real environment. This, then, involves knowledge of and ability in a series of disciplines -- science, technology, engineering, economics, management, law, politics and education. We need across-the-board improvements to the degree that we can apply such knowledge comprehensively in order to protect our environment properly, to the extent compatible with the needs of the socialist four modernizations construction. With that, we will be able to achieve in environmental problems the status described by Comrade Deng Xiaoping: "Make every effort to do things correctly, or make every effort to make as few mistakes as possible, avoid gross distortion and error, and correct mistakes as quickly as possible."

Obviously, the fact that we can hold an academic meeting on environmental social sciences such as we are doing today is in itself an indication that 3 years after the crushing of the feudal fascist dictatorship of the "gang of four," the political situation in China is stable and united, the economic construction undertaking has made great progress through implementation of the "eight-point policy," and academic circles are striving after implementation of the "double-hundred policy". Remember a few years ago, under the extreme leftist rule, when public hazards were dismissed as an incurable disease of capitalism and the superiorities of the socialist system were advocated, as though socialism could put an end to public hazards like an automatic dust remover sweeps up dust? In our endeavors during several decades of revolution, it has been our hope to see China follow the socialist road and move toward the beautiful future of communism under the correct leadership of the Chinese Communist Party. Of course, we have no intention of puffing up the capitalist system. But insisting that a certain social system itself is automatically the sole source of generating or averting pollution is an oversimplification of a complex problem; it is not only inconsistent with objective reality but also lacks a theoretical basis.

In the late spring and early summer of 1980, I revisited America, toured some plants and carefully observed the environment of some cities and towns. I realized that there had been pronounced changes in the environment in America over the last 30 years. In older plants, after several equipment renewals, technology improvements and several generations of products have basically controlled pollution; for newer plants, in their investment policy, feasibility study, design and construction, permission to begin production is granted only after they meet the various standards required by federal and local environmental protection regulations. This goes to show that in order to allay class antagonism, the modern bourgeoisie would rather take part of the profits, equivalent to 8-15 percent of a plant's fixed asset investment, and use modern scientific technology to solve the public hazards that pollute the environment, in return for the renewal and improvement of old industrial zones, and thereby obtain stability and prosperity of this part of the social environment. In this respect, they are looking at the bottom line of the social economy. The modern bourgeoisie is no longer the same as their ancestors 100 or 200 years ago; they do not confine themselves to short-term immediate profits; in order to extend their rule, they have to consider environmental and other social problems as well.

In late autumn and early winter last year, I travelled to Japan, where I visited medium and small enterprises. After rapid development brought serious pollution in Japan in the 1960's, public opinion was clamorous; the government carried out economic intervention and took a number of measures, including technological diagnosis, information exchange, and lower interest loans to modernize the industrial facility and production management of several million medium and small enterprises, and thereby controlled pollution. Most of the medium and small enterprises have achieved the ratings: "small but expert, small but specialized, small and flexible, small and clean, and small but profitable." They did not lose money because of pollution management. Their enterprise structure, production policy and financial and monetary policy insured that more than 95 percent of their small and medium enterprises can not only stand undefeated in the fierce competition on the capitalist international market, but can also continue their civilized production and civilized life after modernization and restructure.

What I saw and heard during these two visits showed how the modern capitalist countries suffered the severe blow of "environmental crisis" in the 1960's and how they improved their production and living environment using modern scientific technology. With such a historical background, environmental science quickly emerged and developed into a new, interdisciplinary science. Some environmental scientists even interpret "environment" as an element of the productive force and carefully study the interdependence of economic development and the environment, resources and population. Simultaneous with the development of technical environmental sciences, research has been active in a whole host of disciplines, including environmental economics, biological economics, ecological economics, resource economics, environmental management and environmental engineering, and each has its own characteristics. In essence, each discipline is a combination of environmental science with a certain specialty, and out of this a unique field in its own right has emerged. There is no reason why we should not select and utilize these fields.

II. Grave Consequences of Underdeveloped Environmental Science

It has been said that environmental science is the product of a highly developed modern productive force. I think that makes sense. Conversely, an underdeveloped environmental science reflects a backward productive force and brings disruption to the productive force and the environment. Looking back in history, the scale of industry was very small before the industrial revolution, and the disruptions to the environment caused by small handicraft industry and handicraft shops were very limited in scope, scale and speed. But in agricultural production, due to the lack of understanding of the natural laws, the production level was too low and numerous types of severe local environmental damage occurred in history, and some of them still remain hazardous today. Here are some examples:

1. Friedrich Engels said in his "Dialectics of Nature." "An animal merely uses the external natural environment and changes nature simply by its own existence; but man uses the changes he makes and forces nature to serve his purposes and controls nature."

"But we must not be overly proud of our victories over nature. For each of our victories, nature has taken its revenge. In each of such victories, we certainly achieved the anticipated results in the first step, but the second step and the third step produced completely different and unanticipated results, which often precisely negated the meaning of the first step results. Residents of Mesopotamia, Greece, Asia Minor and other places exhausted the forests in their pursuit of agricultural land, but they did not dream that these places would turn into today's arid land, because after they had chopped down all the forests, the centers for water collection and storage ceased to exist."

2. Engels continued: "In order to cultivate the forests on the northern slope of the Alps very carefully, Italians chopped down all the forests on the southern slope of the Alps. They did not expect that by doing so they would destroy the foundation of the mountainous animal husbandry in their area, nor did they anticipate that destruction of the southern slope forests would cause the mountain springs to run dry most of the year and the flood water to rush toward the basins during the rainy season."

3. Engels also said: "When the Spanish plantation owners were burning the forests in Cuba to get ashes for use as fertilizer for coffee plants, yielding the highest profit of the generation, were they concerned that the heavy tropical rain would wash away the bare soil and leave naked rock?"

Many of our comrades are familiar with the punishing lessons resulting from destruction of the forest, including the destruction of the ancient Babylonian culture. And yet in many of our regions, not only are forests trampled, but sod is removed roots and all, causing the surface soil to become truly bare ground. This shows that there is still a need to publicize the historical lessons.

4. In the Han occupied areas of China, agriculture has been on a "one-track" course for thousands of years. The loss of original forests was followed by severe water loss, soil erosion, and wind and sand scourge. Particularly in the middle reaches of the Huang He and in the hilly areas of Shanxi, Shaanxi, Gansu and Ningxia, crisscrossing gullies and the eroding and shifting of soil have made the Huang He a "river above the ground". Numerous dike breaches and changes of course on its lower reaches have made the Huang He a notoriously hazardous river in Chinese history and have caused uncountable losses of life and property for many generations. A number of emerging indications now remind us that if we continue to fail to pay attention to stopping the excessive exploitation of the forests along the upper reaches of the Chang Jiang and to preventing severe water and soil loss, the Chang Jiang is in danger of becoming a second Huang He. However, due to the disruption of Lin Biao and the "gang of four" and for other reasons, forests and grasslands were still being destroyed for reclamation purposes as recently as in the 1960's and 1970's, in the one-sided stress on "food grain as the key" policy. Whether from the standpoint of economic requirements or ecological requirements, agricultural endeavors should stress all five aspects and should suit local conditions; we should work on crops, afforestation, livestock breeding, or fishery, whichever is suitable for the local situation. If this minimum commonsense is ignored and large tracts of land are used under blind and ignorant orders, the only result will be that a lot of innocent people will suffer.

Since the industrial revolution, the scale of destruction of the environment and of resources has become increasingly large as large industries emerged and developed.

(1) Extensive development of the mining industry leads to the exhaustion of nonrenewable resources. It has been estimated that at the current U.S. rate of consumption, many minerals in the world will be exhausted within a period of a few years to less than 20 years. For example, it is estimated that zinc will last another one-half year; lead, 4 years; natural gas, 5 years; petroleum, 7 years; copper, 9 years; and bauxite, 18 years. The capitalists used to carry out plunder mining, but why are we also following mining designs that are like "catching all the fish by draining the pond" and "getting the eggs by killing the hen," and building some "short-lived mines"? Disregarding the amount of resource reserves and only one-sidedly pursuing the doubling of production cause early aging and exhaustion of mines. Such practice should have been halted long ago.

(2) Extensive development of logging and fishing leads to excessive loss of renewable resources and disrupts the ecological equilibrium and the ability to

restore and to replenish. What causes such adverse conditions? In China we should look to the overburdening logging and fishing targets, the unscientific methods, and the long lack of cohesive and forceful forest and fishing laws.

(3) Since the 1930's, along with extensive development of industry, many newly established industries such as metallurgy and organic chemical engineering and industries involving radioactivity have discharged great amounts of pollutants into the material cycle of nature. Hydrogen fluoride and sulphur dioxide were nonexistent in the original natural environment. It has been estimated that the total amounts of pollutants discharged by cities in the world in 1 year are: solid waste, 3 billion tons; various types of sewage, 500 cubic kilometers; and various kinds of aerosols, 1 billion tons. The amount of pollutant discharge obviously surpasses the self-cleansing ability and capacity of the environment. The amount of poisonous gases released into the atmosphere per year has also been estimated: dust, 100 million tons; sulfur dioxide, 146 million tons; carbon monoxide, 220 million tons; nitrogen dioxide, 53 million tons; hydrocarbons, 88 million tons; hydrogen sulfide, 4 million tons; for a total of more than 600 million tons. Because of atmospheric pollution and damage to forests and vegetation, the amount of carbon dioxide in the atmosphere is accumulating at a growth rate of 4 percent every 10 years. This will lead to elevated temperatures and dryness in global weather, which will have unpredictable effects on the economic activities of mankind. The reason we have brought this up is to compare the weather changes in our region and to look for the cause of some vicious cycle phenomena.

(4) The improper technical policy of industry serving agriculture brought increases in agricultural production but many adverse results. Machine farming and deep tilling in the reclamation of large tracts of land may damage the cluster structure of soil and cause soil function degradation The accumulation of residual pesticide and herbicide toxicity in soil and in crops may enter human bodies and cause disease and cancer. Research on till-free farming and tilling-resting farming are underway in foreign countries, along with the investigation of biological nitrogen-fixing and biological prevention of disease and pests. But some of our units are still tirelessly using old model farming machinery, single-variety nitrogen fertilizer, and pesticides containing chlorine and phosphorus, computing speed and proportion based on production; little attention is being paid to the relationship between economic effects and gain.

One can therefore see that modern large-scale production is also "modern large-scale destruction" if it is carried out against the laws of nature and ecology.

III. Environmental Management

1. Object of Study and Nature of Professional Management

Some comrades say that environmental management is one facet of overall economic management. I think that makes some sense. However, whether we are faced with the particular characteristics of environment or with the common characteristics of economic undertaking, environmental management must study the theory and method of administration in addition to the theory and method of economic management. Therefore, I suggest that environmental management be ascribed the nature of a professional management discipline.

2. Major Tasks of Today

At present, environmental protection still falls into an optional blank area in the study of the economic management system. As pointed out by some comrades, our present economic management system is of the collective type, where administrative management is carried out according to item and area, and the administrative organization has from several hundred thousand to 1 million economic organizations as subjects of supervision. Concerning environmental protection topics such as the cleaning up of the "three wastes," recovery and utilization, and even the protection of the environment, industries and enterprises are essentially doing things according to conscience and according to their biases; there is, in fact, very little internal economic motivation or external economic pressure. Even if one wishes to do something good in this area, the arrangement of manpower, material and financial resources is still up to the plans and directives. If they happen not to work out, even under the principle of "whoever pollutes, cleans it up," nothing really can be done. The question of how to make environmental management play a role in the economic management system is very worthy of our study. Management cannot remain apart from managerial organization, method, system and instruments. My suggestion as to what we should do about the environmental management system is that we should come up with an active and practical proposal following in-depth academic discussion.

IV. Environmental Economics

1. Object of Study and Its Interdisciplinary Nature

Karl Marx said: "Socialized men and united producers will rationally rectify the material transformation between nature and themselves, putting it under their common control instead of letting it rule themselves like a blind force. This material transformation should be conducted with the minimum expenditure of effort and under conditions most compatible with their human nature." I believe the object of study of environmental economics is to investigate a rational rectification of the material transformation between man and nature which allows not only the optimum short-term, direct benefits but also good long-term, indirect results in the economic activities of mankind. The combined realm of the economic reproduction process, the environment and the ecological system is the field of study of environmental economics. Therefore, environmental economics is an interdisciplinary science that spans both social science and natural science.

2. Major Tasks Today

(1) To investigate what special considerations should be given to environmental protection in the general equilibrium of the national economy and the economic structure, some comrades have suggested the following two main points of investigation in order to achieve constructive results:

A. How should ecological equilibrium be incorporated into the planning of the national economy? Comrade Chen Yun [7115 7189] has long been an advocate of balance in finance, credit and material supply. In the past 2 years, due to the actual needs in import-export work, many comrades have been in favor of a foreign trade balance. In view of the present acute, disastrous situation, some comrades also believe that we should get a firm hold on ecological equilibrium. I believe these are new suggestions for a new situation. In terms of theory and method, the more important economic effects of speed and proportion should be combined and given simultaneous consideration in the planning of economic development. Economic benefits should be considered from the standpoint of both economics and ecology. This should be the case from both the macro and the micro aspects. For instance, the upper limit of the amount of logging should never exceed the amount of growth, if we are to have a proper ratio of usage and renewal and have green hills for our continuous use. Also, in the treatment of the "three wastes," it is not enough merely to eliminate the necessity to pay pollution compensation to agriculture, forestry, livestock raising and fishery; we should not figure the gain and loss merely on the basis of expenditure to treat pollution and the direct fines assessed to compensate for losses; we should also figure in the irreparable damage to the environment, the benefits derived from an integrated utilization of energy and resources that are capable of reversing the deficit, and the intangible benefits of a stable social economy. By looking further down the road and by having a broader understanding of the situation, we will naturally be able to appreciate and take the whole situation into consideration and carry out coordinated and unified planning.

B. In the economic structure, we must establish the proper ratios between the industrial and agricultural production departments and the departments responsible for monitoring and cleaning up of pollution and the manufacture of pollution clean-up equipment. Some people believe that not having a pollution treatment department in the national economic structure is like a human body without a kidney or with a kidney failure. It is reported that the pollution prevention equipment business in Japan has developed rapidly in recent years; in 1974 its sales volume was 670 billion yen, equivalent to 4.2 billion yuan [in Renminbi], a more than four-fold increase as compared with 1964. I think the experience of these capitalist countries is a good mirror for our socialist construction. We now have a good capacity for mechanical manufacture; if we can only realize the necessity of establishing such an industry, we are entirely capable of accomplishing this task.

(2) The relationship between productive force layout and environmental protection must be studied. There are three benefits of a rational productive force layout: first, nature's self-cleansing ability can be fully utilized; second, the general usage of energy and resources can be improved; and third, it will be possible to carry out concentrated treatment and recovery of the "three wastes" under specific conditions.

How do we set out to do the actual work? Here we should study some methods: The scope and development direction of cities and industrial bases should be rationally regulated in order to avoid excessive concentration or diffusion of the productive force. After the cities are planned, the building of plants that pollute should be rigorously prohibited from the up-wind direction, on the upper reaches of water sources, near underground water supply zones and in densely populated areas. Plants with closely related joint products, byproducts and "three wastes" recovery may be laid out in groups in order to achieve closed-cycle circulation of the "three wastes" within a small area of the industrial zone (such as the case in Kashima, Japan). Environmental impact preevaluation should be conducted for new plant construction, and rational site choice and layout should be carried out on the basis of the plant's total pollution emission, composition of the major pollutants, and environmental capacity in the vicinity of the plant site.

In addition, policy decisions concerning all economic construction projects large enough to improve the environmental conditions or effect ecological equilibrium, such as integrated use of energy and resources and large water conservancy projects (for example, bringing water from south China to north China or guiding the water of the Huang He into Shanxi), should be preceded by comprehensive preevaluation of the results conducted by an organized force of relevant disciplines and careful consideration of the advantages and disadvantages.

As can be seen, the problems in environmental economics involve more than just the cleaning up and recovery of the "three wastes," and environmental economics should be an important component in the theory and method of national economic planning. Regarding the modernization of the 350,000 existing old industries and enterprises, the approach that naturally comes to mind is a stage-by-stage, group-by-group renewal of equipment, generation change of the product and improvement of the technology. For that purpose, we should get organized in the meantime and settle the old score of "three wastes" treatment and recovery utilization. This may be the only good approach, as it not only improves production, but it also reduces expenses and protects the environment. There are now 1.4-1.5 million commune and brigade enterprises in China, and there will be substantial development in the future, so taking the proper approach to avoid proliferation of the "three wastes" in rural areas is also a major problem. It now appears necessary to appropriate special funding for environmental protection and to use it to take care of urgent problems, new problems and to plug up holes here and there. But the fundamental solution still lies in the long-term national economic plan incorporating environmental protection solutions, as the present arrangements are already falling behind the demands of the conditions of development.

V. Environmental Law

The environmental economic work and environmental management work mentioned above should be gradually institutionalized and legalized to form a body of economic legislation. In addition to the current Environmental Protection Law, a series of regulations and ordinances should be enacted to insure the effective enforcement of environmental protection. Some of our comrades say we now have a peculiar phenomenon: if someone takes a 100 yuan bribe, he can be sentenced in accordance with the law; but if someone wastes millions or billions of yuan, disrupts the ecology and environment of a whole area, or half a river basin, or a great tract of land on the surface of earth, with serious adverse effects lasting for several decades or even generations, he can escape punishment. This phenomenon cannot be tolerated in the socialist legal system. The problem here is to study and solve problems through environmental legislation and environmental judicial measures.

The question of how to insure the effective implementation of environmental regulations under the present economic management system and how to improve them to meet the environmental protection needs in the process of economic reform are also topics of study for environmental law.

Environmental Economics

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[Article by Liu Wen [0491 2429] of the Beijing Municipal Environmental Research Institute: "Introduction to Environmental Economics"]

[Excerpts] The investigation and solution of environmental economic problems is attracting increasing attention. On a global scale, in the 10 years since the United Nations Environmental Planning Bureau held a conference on human environment in Stockholm in 1972, observation and analysis of the changes in human environment have made it clear that if environmental economic problems are ignored, the prospects of solving the entire human environment problem will not be encouraged.[1] This international organization has therefore determined to make "environmental economics" the number one topic in its 1981 "Report on Environmental Conditions," ahead of such topics as "Utilization and Management of Regenerative Resources: Underground Water" and "Toxic Chemicals and the Human Food Chain," which are usually considered more important. In China, after years of practice in environmental protection, it is also recognized with increasing clarity that environmental economics is "an important component of environmental science and an important scientific basis for effective environmental protection work."[2] Furthermore, after the 1978 national science conference, research topics on environmental economics have been incorporated into the national development plans for science and technology and economic science in a timely manner. All these developments indicate that in order to gain faster and better understanding of the environmental problem, people both here and abroad have made a big jump in ideological understanding and have entered a new realm in practical action as well. It is quite clear that technology and economy are the two indispensable elements in solving the environmental problem; avoiding the study and solution of the environmental economic problem is no different from abandoning the study and solution of the entire environmental problem. But even though environmental economics is so important and significant, it is after all only in the exploratory stage in China. In particular, if environmental economics is to become an independent academic discipline, the establishment of a complete body of theory and methodology is still awaiting the joint effort of experts, scholars and all comrades interested in this work. In this article, we present some rudimentary views on the tasks and topics in environmental economic research.

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[1] See the closing address by Dr Mostafa Tolba, executive director of the United Nations Environmental Planning Bureau, at the eighth conference of the Administrative Council held in Nairobi on 29 April 1980.

[2] Li Chaobao [2621 6389 0130]: "Address to the National Academic Exchange Conference on Environmental Management, Economics and Law," 25 February 1980, Taiyuan.

Tasks in Environmental Economic Research

Environmental economics is the science that studies the intrinsic relationship between environment and the entire social economic process in order to protect and improve the quality of human environment. It is an applied science belonging to the intersecting region of natural science and social science. Its tasks are: using the basic principles of Marxist-Leninist political economics, productive force economics and dialectical materialism and the scientific method of quantitative economics, combined with the practical experience of China's modernization construction, to interpret the general economic laws of socialism as manifested in the realm of environment and the unique economic laws in environment, provide the nation with a scientific basis in establishing environmental protection policies, explore avenues and measures for protecting and improving the human environment by combining economics with technology, management and the legal system, and to protect the health of the population and promote continued development of production in the society.

In the beginning, the production of material on which the human race based its existence and progress relied principally on manpower and animal power; some natural forces such as wind and water power were also used in fishing, hunting and farming. Although there were threats of floods, wild animals, unpredictable weather and onsets of soil erosion, shrinking forests and a deteriorating steppe, on the whole, the effects on the environment were relatively minor and the conflict between development and environment was not very acute. The discovery and use of coal brought changes: although on the one hand, it greatly promoted the progress of production--for example, the transportation power of a steam locomotive burning 1 ton of coal is equivalent to that of a 10,000-strong labor force--on the other hand the dust and hazardous gases such as carbon monoxide and sulfur dioxide generated in burning coal remain major pollutants of the environment even today. The other mineral resources subsequently developed all produced great quantities of the "three wastes"--liquid waste, gaseous waste and solid waste--and gradually intensified the pollution of the environment. In the last few decades, industrialization and urbanization have accelerated the deterioration of the environment. Public hazard incidents one after another have shocked the world. Because of this, the United Nations held its conference on human environment in Stockholm in 1972, which attracted world attention, and established an Environmental Planning Bureau to meet this awesome challenge. China is a developing socialist state, and both the party and the government take environmental protection very seriously. The constitution clearly states: "The state shall protect the environment and the natural resources and prevent pollution and other public hazards." Special organizations were established in the State Council and in various departments and regions. Especially since Premier Zhou Enlai personally supervised the First National Work Conference on Environmental Protection in 1973, great efforts have been directed toward carrying out the "32 character policy" of "overall planning, rational layout, integrated utilization, change hazards into advantages, rely on the public, everybody pitches in, protect the environment, and benefit the people," and a preliminary foundation has been established for the environment protection effort in China. On the whole, however, the environmental problem in China not only remains unsolved but it is not even under control; the situation continues to deteriorate. The treatment of old pollution sources is proceeding slowly and new pollution sources continue to appear; this remains a prominent problem in environmental protection. According to statistics collected in 10 provinces and municipalities including Beijing and Heilongjiang, waste water emission in 1979 was 7 percent higher than that in 1978, which in turn was 13 percent higher than the 1977 figure; waste gas emission in 1979 was 5 percent more than that in 1978, which in turn was 11 percent more than the 1977 figure; solid waste emission in 1979 was 3 percent higher than that in 1978, which in turn was 7 percent more than the amount in 1977. The fact that the "three waste" emissions increased year by year was by no means accidental, but rather was the penalty we paid for going against objective laws in our socialist construction process. If we wish to be set free of this penalty, we will have to change our customary behavior and conform to the requirements of these objective laws. However, this is no small step, as Comrade Mao Zedong once pointed out: "In terms of socialist construction, our entire party is inadequate in knowledge. For a period of time henceforth, we should accumulate experience, work hard to learn and gradually deepen our understanding of its laws through practice."[3] These laws include natural laws and economic laws.

The laws of economics are laws of economic movement. In a historical temporal observation there are laws that apply to all economic periods, several economic periods or just one economic period; in a cross-sectional spatial observation, there are laws that apply to the entire economic society, to several economic aspects or to just one aspect of economy. The laws we wish to interpret in our study of environmental economics are only those that apply to the socialist historical period and are related to the environment. If these laws are to be used in an economic system on environment in the era of socialism, the dominant rules, as in the entire national economy and in other fields, are still the basic economic laws of socialism.

The basic economic laws of socialism are manifested in the dialectic relationship between the development of production in the society to satisfy the needs of the society and the society's need to further stimulate production. In the words of Stalin, the main characteristics and requirements are: "Use those methods based on high technology that make socialism continue to grow and improve in order to insure the maximum satisfaction of the ever-growing material and cultural needs of the society."[4] This principle was proposed as a counterpart to the fundamental economic principle of capitalism, the law of surplus value; their basic distinction is in the different goal of production. The goal of production in socialism is the maximum satisfaction of the ever-growing material and cultural needs of the entire society, and this is consistent with the goal of environmental protection. Furthermore, the people's needs can only be satisfied completely by combining the two. In other words, the needs of the people that we should satisfy are not merely the upgrading of the material and cultural enjoyment; we must also provide the people with a proper environment in which to live and work, because, in the first place, a suitable environment itself is one aspect of the people's need. This point may be proved with a negative example: superior material enjoyment and colorful literature and arts notwithstanding, if the person is a terminal shuiyu bing [3055 8049 4016] patient in extreme pain, how can his life be considered desirable and happy? Second, an agreeable environment is also an important condition for realizing the people's needs in other aspects. Engels discussed this point in his "Anti Duering": "The first thing a steam engine needs, and the major need of every production department in a large industry, is clean water." Of course, the effect of an adverse environment is not limited to the pollution of industrial water; it erodes and undermines all the essential elements of production and eventually leads to the degradation of the quality and quantity of production. This invariably affects other aspects of the people's lives as well. Hence, creating a suitable environment for the people to live and work in is a goal of socialist production. Only when this point is clarified theoretically can we then proceed to establish scientifically the status and role of environmental protection in the entire reproduction process of the society and in the various departments of the national economy, and to promote the undertaking of the development of environmental protection in China.

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[3] Mao Zedong: "Address to the Enlarged Session of the Central Work Conference," 1962.

[4] Stalin: "Economic Problems in Soviet Socialism," p 31.

Naturally, the task of studying environmental economics is not just elucidating the general economic principles of socialism and its manifestation in environment, nor is it limited to grasping the complex and constantly varying environmental economic problems in order to sort out the particular economic principles unique to the environmental problem and encouraging people to recognize and respect these principles. More importantly, we must also find methods to apply these principles and help the public grasp these principles and carry out business accordingly so that the theory can serve practice directly and be tested in practice. For instance, people have recognized that the waste of resources (including energy sources) is an important cause of today's environmental pollution. According to reports, the average loss rate of mining mineral resources in China is as high as 40 to 50 percent; in addition, the waste in transportation, refining, processing and utilization are even more alarming. One of the important causes of the waste of natural resources is the "noncompensatory" nature of their use. In order to eliminate the root cause of this wasteful phenomenon and change the use of natural resources from "noncompensatory" to compensatory, some countries are conducting research to seek solutions. Alun Kangte'er [phonetic][5], member of the Royal Society of Great Britain, for one, believes that in order to restrict consumption and protect resources, they must be given a value in one way or another; Michel Crepeau, minister of environmental protection in the French Government, went as far as to set up a "natural wealth assessment and accounting group" for this purpose. However, due to differences in society background and point of view, we cannot hope to simply "import" their solutions to solve our problems. For example, Kangte'er [phonetic][6] believes that "in today's world conditions, the consumer value theory--including the intrinsic value of rare and scarce resources--is closer to reality than the production value theory"; he even goes on to say such things as: "The economics of Marxism led to the waste of natural resources." We must insist on the precondition of Marxism-Leninism and Mao Zedong Thought in the search for solutions that suit our socialist system to solve our problems.

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[5] Alun Kangte'er [phonetic]: "Environmental Economics," Series on Resources and Environmental Science, English edition, p 6.

[6] ibid, pp 7-8

Nevertheless, our insistence on Marxism-Leninism is by no means intended to limit ourselves to the existing books on Marxism-Leninism and to bind ourselves by some Marxist-Leninist viewpoints that are in vogue; instead, we should liberate our thinking, explore boldly, and scientifically consolidate the new experience and new knowledge of mankind on the premise of Marxism-Leninism. It is the vital sign of a constantly progressing history that answers to things in one age are not entirely the same as those of a previous age. For example, in order to determine the value of natural resources, some of our environmental economics workers are now conducting new investigations on the Marxist-Leninist view of natural resource value. In the area of renewable resources, our comrades have published articles discussing the question of establishing a fee system for forest resources; regarding nonrenewable resources, the Ministry of Geology briefed the central leadership on the question of mineral resource compensation, and comrades of the central leadership took this question seriously and believe that studies are necessary. Our determination of product price is made according to the requirement of the value principle and on the basis of the value. The value, in turn, is determined by the necessary labor and time the society has to spend in producing the product. For natural resources, however, if their prices are also to be determined by their value, then how will the value be determined? In our thinking, since they are "God-given" and do not involve the labor and time of the society, their value cannot be determined on the basis of society's labor and time. Therefore, should their value be determined by their usefulness, amount of reserves, quality, distribution, the effects on the environment in their development and deployment, and the degree of difficulty of pollution prevention? If so, we suggest that a "shadow price" be given to them. Then we can view the state-owned natural resources as fixed assets, and when they are developed and utilized, economic measures can then be taken to control their use and encourage conservation.

In short, to protect and improve the environment of the human race and to realize our complete rule over nature, we must strive to recognize and manage to use all the relevant objective laws. The understanding and application of economic principles and the relationship between economic laws and natural laws are fundamental tasks of our study of environmental economics.

9698
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ENVIRONMENTAL PROTECTION, IMPROVEMENT, EDUCATION WORK BEGUN

Environmental Science Tasks Outlined

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 4, 1981 pp 1-3

[Article by Xiong Yi [3574 3015]: "Protect the Environment, Build the Environment, Reform the Environment"]

[Text] I. The Task of Environmental Science

Environmental science is mainly the study of the environment in which people live and the effects of the environment on human beings. The mutual relationship between man and the environment is very close, and environmental factors are interrelated.

Therefore, environmental science is the science that studies man's ecological system. There are various kinds of living beings and non-living factors in the space in which human beings live, and they are environmental factors. Plants, animals and microorganisms are biological factors. Water, soil, air, light and heat belong to non-living elements; all make up the environment. The living and non-living factors together form a network-type structure, and each environmental factor or component is equivalent to one link in the network. They are mutually connected and mutually limiting. The structure of different spaces is different, and their functions are also different. The structure and the functions are mutually adapted to each other and also contradict one another. Therefore, in each ecological system, different materials and different energy cycles and conversion are produced, thus promoting changes in the ecological systems. The ecological systems undergo change, and the environment of course also changes. In addition, the continued development of human society causes the ability to interfere with the ecological system to continually increase, thus the study of environmental science becomes more and more complex, and is emphasized more and more by people.

Environmental science not only concerns environmental pollution and its prevention, it also includes the destruction and construction of natural resources. Whether by natural forces or human activity, all activities that can affect a certain environmental factor and cause a change in the ecological system falls into the realm of environmental science studies.

The tasks of environmental science studies are protection, construction, and reform, i.e., protecting the environment, constructing the environment, and reforming the environment.

1. Protection: Prevention is more important than treatment. Protecting the environment is a very important task. Generally speaking, there are three aspects: One is nature preserves. To understand the structure, function and the evolutionary patterns of the ecological system under natural conditions, a certain typical area must be kept as a nature preserve for research and for use to protect valuable plants and animals. The second is preservation of water and soil. Natural resources must not be destroyed, forests must not be felled without plan, grasslands must not be reclaimed without plan, and we must not use irrational damming of rivers and encircling lakes to destroy the ecological balance and cause the ecological system to degenerate. The third is to protect the environment from pollution by the "three wastes" and farm chemicals. The pollution by second generation farm chemicals such as BHC and DDT must be controlled. While developing trial production of third generation farm chemicals of high efficiency, low toxicity, low residues, the study of comprehensive prevention and control of diseases and insect pests centered around biological prevention and control should be considered. In addition, chemical fertilizers should not be overly used. Applying too much is not only wasteful, it will also cause pollution. Environmental protection must take prevention as the main effort. First, we must treat the polluting source and eliminate pollutants. In industrial and mining regions or other large scale engineering projects, rational and overall planning should be carried out on the basis of a full study of the environmental effects to prevent worsening of the environment.

2. Construction: This is to build a good environment. Developing industrial and agricultural production and increasing the physical health of the people is our wish. The human ecological system is not only composed of living and non-living components, it also includes human productive activities and socio-economic conditions. A good ecological system should possess a harmonious structure and a highly economical material and energy cycle which can adapt to elastic fluctuations of local natural conditions, which also possesses a certain ability to purify the environment, and which can develop the best productive efficiency to provide mankind with stable biological products of superior quality and high yield and promote the physical health of the people. Establishing a good environment so that the ecological system can develop in the direction favorable to mankind is the purpose of our study of environmental science.

Since the emergence of man, and with socio-economic development, changes in the environment and ecology have become greater and greater. Human activity that coincides with the patterns of natural development can benefit from the environment and ecology. Conversely, human activity which is not carried out according to scientific rules will destroy the environment and the environment will be harmed by such activity. After destruction and pollution of the environment are improved, we must further construct an even better environment. This is the meaning of environmental construction.

3. Reform: Viewing the historical experience of human development, the uncontrolled use of natural resources that is contrary to natural laws and that is irrational will necessarily lead to a revenge by nature, for example, leaching of the mountain regions, meadows becoming deserts, secondary salinization and waterlogging of plains, land becoming swamps, and because of irrational development of dryland and mountain and hilly regions, the ecological system has been destroyed. Especially with the development of modern industry, environmental pollution is worrying people more every day. Cities that have serious polluting sources are frequently situated in regions where the ecological system is better, and they pose a grave threat. Regions where the ecological environment has already been destroyed must be quickly treated, and efforts should be exerted to build a rational ecological system and to gradually rebuild it so that it can reach a good or superior standard and satisfy the people's wishes as early as possible. The Huabei Plain which has constantly been threatened by salinization and waterlogging, the northwest loess plateau and the southern red soil hilly region seriously affected by leaching should all be reformed with more efforts so that the present low yielding ecological system can be improved. In some regions, human activity has caused the substances or elements originally hidden and buried deeply in the lithosphere to rise to the ground surface and release toxic substances harmful to human and living beings, or substances are concentrated by biological chains, causing damage or creating a slow collapse of the ecological system. In some regions, because of an overabundance or a lack of some elements, various regional diseases have occurred. All of these must be urgently improved. In particular, close attention must be paid to pollution caused by the "three wastes" of industry and mining and farm chemicals. Of course, it is best to take prevention as the main effort, but if the environment has already been polluted, then comprehensive measures should be taken to eliminate the damage by pollution.

II. How to Develop the Study of Environmental Sciences

I believe the following three aspects are worth our attention.

(1) Using the concepts of ecological systems to study environmental science. The research task of environmental science is to create a good environment to serve mankind. Agriculture, industry and every profession all have their own different environmental conditions and different management methods. Whether it is environmental research or environmental management, they all must insist on upholding the concepts of the ecological system. The environment is a complex ecological system that weaves together natural conditions, colonies of living beings and human society. There are many types and forms of research and there is a definite regional character. Therefore, we must aim research at one problem within a specified region to study the regional ecological system before results can be achieved. Environmental conditions vary at each locality, so we must analyze the major composition and functions in the ecological system according to the specific conditions of different regions, and we must analyze the balance of the cycles of the flow of energy and materials before we can establish ecological subregions, conduct effective regulation and control, propose ways of improvement by suiting measures to local circumstances, and create a good ecological system. The final goal of research of environmental science is to create an environment that is suitable for human existence, that can produce increasing material wealth and that can adapt to the ever developing social civilization.

When any region is polluted, we must first study what is the pollutant. Then we must find the polluting source, and clearly understand what kind of ecological system the pollutant has entered and what effects it creates. Next we must study the migration and conversion of the pollutant, and find a method of treatment. This is the entire process of using the concepts of the ecological system to study the environment.

(2) Using the viewpoint of motion to study ecological balance and environmental changes. The ecological system is mobile and changing. It can develop in a good direction and it can also deteriorate in a bad direction. Within a definite period, the ecological system maintains a certain stability. This is ecological balance. Environmental change destroys the ecological balance. The old ecological balance is not always good or advanced. It is necessary for us to reestablish a superior ecological system. This means breaking the old ecological balance. Of course, to establish a new ecological system, there must be sufficient conditions. Otherwise when the old ecological balance is broken and if the new ecological system is not established, the results will be disastrous.

The items of human productive activity are many. The destruction of environmental conditions caused by man and the irrational transportation of materials and energy will all seriously affect the ecological system. Felling forests without control, reclaiming grassland without control, burning mountains to create land for planting, encircling lakes to create paddy fields all have a relatively visible effect upon the ecological system, and such effects can be detected by man. But the effects upon the ecological system produced by irrational application of fertilizers, planting, irrigation and drainage and continuous planting of crops, and application of farm chemicals are not easily detected and are overlooked by man. Therefore, we should conduct long term observations and tests at fixed localities. The pattern of evolution of the ecological system can be deduced from the exchange and circulation of materials and energy under different environmental conditions. But the findings are not as definite as directly studying the effects of human productive activity upon the ecological system. Rational human activity can make the ecological system develop in a good direction. Irrational artificial measures will lead the ecological system towards changes in a bad direction. "Guilin's scenery tops the world." This was originally a beautiful environment. But during the "cultural revolution," we did not use the concepts of ecological systems to analyze the problems, blindly building many factories, causing serious pollution, destroying the original ecological balance, and making the beautiful scenic region a polluted environment. Recently, the factories and mines have been closed down and the environment has gradually improved. After a good scenic region has been built, the environment at that time will be a new ecological balance, not a revival of the original ecological balance. As science and technology and social economy develop, man's ability to interfere with nature becomes greater and greater. Therefore, our future work is how to establish a good and new balance, not longing for and reviving the original ecological balance. We should use the viewpoint of motion to study ecological balance and environmental change.

(3) Developing the study of environmental science in many fields and many ways. Using the concepts of ecological systems to study environmental science is to study the system's structure, function and reaction to human interference. The ecological system is a research subject that possesses "stratification" and complexity.

studies can be thorough and done well only by realizing the following three combinations.

The first is the combination of the macroscopic viewpoint and the microscopic viewpoint. Macroscopic viewpoints and microscopic viewpoints are dialectically related. Macroscopic research is the origin and the home of microscopic research. Microscopic research is the foundation of macroscopic research. An ecological system involves large area work. If macroscopic investigations and research are not carried out, its general situation cannot be understood, and it would be difficult to study the patterns of change of the system, and planning for the whole system cannot be carried out. In addition, the study of ecological systems should be based on a clear investigation of the composition of living matter and non-living matter within the system, and on a clear understanding of the functions and the mutual relationships among the factors, and the circulation of the flow of energy and materials. This detailed research is also very important. Therefore, the study of environmental science must combine the macroscopic and the microscopic viewpoints, and it must combine investigation and research.

The second is the combination of comprehensive analysis and research in single subjects. Environmental science is a multi-angular frontier science. It involves many disciplines. Earth sciences, biology, and chemistry are the main disciplines, with physics and mathematics being related disciplines. Pedology is the science that links earth science, biology, and chemistry tightly together, it is also an important component and regulating body in studying the ecological system. Without combining the strengths of the various disciplines, environmental science cannot develop. But if each discipline does not have in-depth research, the development of environmental science is also very difficult. Therefore, environmental science research must be carried out under unified leadership and by mobilizing many disciplines, and it should carry out comprehensive analysis to combine research of single subjects and comprehensive analysis before research can be profound and before the conclusions can be correct without leading to onesidedness.

The third is the combination of general analytical research and the application of modern technology. Research in environmental science must lead the development of other related disciplines.

At the same time, the development of each discipline will stimulate environmental science. But environmental science is a very complex comprehensive task, it must have a broad range of investigative information, it must also have data from fixed point observations, and furthermore, it must have research results using precise instruments. This is the combination of ordinary analytical research and application of modern technology. Modern technology includes the application of large instruments as well as application of remote control, computers and isotopes. With modern technology, environmental science can develop rapidly.

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Education Work Stressed

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 4, 1981 pp 46-47

[Article by Mao Danhe [3029 1998 0735]: "How the Ministry of Chemical Industry Is Handling Education in Environmental Protection"]

[Text] The State Council's decision concerning strengthening environmental protection during the period of readjustment of the national economy clearly points out: "Environmental protection is a new business, it requires a large amount of talent with special knowledge. Training of talented people in environmental protection must be included in the nation's educational plans" and this should be combined with the actual situation in environmental protection work of the chemical industry to make us become more aware of the importance and the urgency of the propaganda and education in the knowledge of environmental protection, on the job training of cadres in environmental protection through continued summarizing the experience and lessons in environmental protection work, therefore, it must be grasped as an important component of the whole environmental protection work. Our main method is:

1. Propagandize the knowledge of environmental science in a big way, mobilize the broad numbers of workers to grasp the enthusiasm of environmental protection.

Environmental protection is a comprehensive work involving a broad scope. To do this work well, we must propagandize the masses, mobilize the masses and mobilize the enthusiasm in each sector. In this regard, in addition to concentrating for a period of time each year on propagandizing the Environmental Protection Law and environmental sciences knowledge, in keeping with related requests concerning the launching of environmental protection propaganda activities issued by the Environmental Protection Leading Group of the State Council, we have also held lectures on environmental protection, inviting professors from the Beijing Chemical Industry College to talk about environmental protection to agencies under our ministry. Because the minister, the department chiefs and bureau chiefs and other such leading comrades led the way to listen and learn, over 1,000 people from throughout the ministry participated in the lectures. To improve the quality of the lectures, the ministry's Environmental Protection Department actively provided information before each lecture to help the teachers write lecture notes of 40,000 words, and printed the notes into books for distribution. The lectures were held on four afternoons totaling 12 hours. The content of the lectures was rich, including environmental pollution and damage, pollution by the chemical industry and its prevention and control, introduction to the progress of environmental protection work in our nation, and introduction to the experience and lessons of foreign environmental protection work. After the lectures, many comrades said with feeling: Developing production and protecting the environment are two sides of the same question, they are contradictory and they can be unified. The problem is to prevent onesidedness in the course of building production, to unify them on the basis of maintaining the benefits of the entire society and long range benefits. One must not care only about partial benefits and immediate benefits and cause environmental pollution. Through the holding of lectures on the knowledge of environmental protection, the cadres of the agencies learned about environmental protection, and more importantly, the understanding of environmental protection work was unified, and an ideological foundation for doing environmental protection work well was laid. For example, many comrades of the agencies of the ministry habitually talked only about production and were not interested in grasping environmental protection. Now most comrades can grasp well the environmental work related to their own business.

2. Holding on-the-job training for leading cadres in operations training classes and including education in environmental protection knowledge as an important part.

The key to doing environmental protection well is that the leadership emphasizes it and gives support. To attract the attention of the leadership, brief reports on environmental protection work must be frequently made to the leadership and the leadership must be made to understand some scientific knowledge in environmental protection. Therefore, when our ministry organized operations and technical training classes for the leading cadres at each level, it paid attention to including knowledge of environmental sciences as part of the educational content. For example, the economic management study class already held for the chiefs of chemical industry departments (bureaus) of each province, city, autonomous region and the chiefs of departments and bureaus of the agencies of the ministry and the operations learning class for plant managers of key chemical industry enterprises and department heads of agencies of the ministry not only provided a concrete arrangement for them to learn the knowledge of production techniques and management of chemical industries but also stipulated the content and time of learning about scientific knowledge in environmental protection. During the writing of the two books "Economic Management Lectures" and "Business Management in the Chemical Industry" for the two types of training classes mentioned above, special chapters on the knowledge of environmental protection in the chemical industry were included, totaling over 30,000 words. The content was relatively systematic and general. At present, 12 sessions of these two types of training classes have been held and over 2,000 people have received training. It is planned that after several years of efforts, the leading cadres of the chemical industry departments (bureaus) of each province, city, autonomous region and the leading cadres of key chemical industry enterprises will have been to one training session.

3. At present, most of the cadres in environmental protection on the chemical industry front are new recruits transferred from other posts, so they are novices. They have not received education in the specialized knowledge of environmental sciences. The operation and techniques of environmental protection are at a low level and they cannot adapt to the development of environmental protection work. Everyone has a strong wish to learn. Thus, our ministry commissioned Xiangtan University last November to hold a short term training class in environmental protection in the chemical industry lasting two months on a trial basis. The students for such training were chiefs (section chiefs) of environmental protection departments of key chemical industry enterprises and some of the nation's provincial and municipal chemical industry departments (bureaus), chiefs of environmental affairs offices and engineering and technical personnel in charge of environmental protection work, totaling 30 persons. The university chose five teachers from the special teaching and research laboratory in environmental protection of the university's chemical industry department who possessed teaching experience to teach the classes. They prepared the teaching materials well before the start of the classes, wrote 140,000 words of teaching materials in environmental protection in the chemical industry and printed the materials in book form and

distributed them to the students. To adapt to the particular characteristic of cadres currently involved in environmental protection work who have a strong understanding and definite practical experience, class hours and review hours were equally divided. Of the more than 190 learning hours, lectures on basic theory of environmental science took up one third and lectures on the techniques of treating the three wastes and monitoring the environment constituted two thirds. At the same time, the teaching method of combining classroom lectures by teachers with organized student discussions of specific subjects were used. The teacher chose the topics for discussion, the students gathered information and prepared guidelines for oral reports. One person was elected to deliver the reports. Everyone expressed his opinion, then the teacher summarized and improved the opinions according to theory. Everyone felt this was a good teaching method. One, it linked theory with the actual situation, and applied what was learned; 2. It deepened understanding of the knowledge learned in the classroom; 3. It allowed mutual exchanges of what was learned and the experience of each unit in launching environmental protection work. At the final exam, 25 students received high grades and 5 received good grades. Some students even wrote papers up to academic standards. This proves holding short term classes is an effective way to improve the operations and technical standards of on-the-job environmental protection cadres. Therefore, we plan to continue to hold Xiangtan University's short term training classes. When summarizing the experience together with the teachers and students, everyone believed that the students participating in the short term training classes should not be too different in age and cultural level. Environmental protection management cadres and technical cadres should be placed in separate classes. The teaching materials should be written separately according to the working needs of the managerial cadres and the technical cadres. The former should emphasize managerial knowledge, and the latter should emphasize control and treatment techniques.

4. Actively urge the colleges, universities and schools to establish special staffs in environmental protection in the chemical industry to provide talent for the environmental protection front.

Establishing well the team of environmental protection cadres in the chemical industry by simply hastening present operations and technical training of environmental protection cadres is not enough, we must rely on the universities, colleges and academies and schools to provide new and emerging forces. For this, we surveyed the need for specialized talent in environmental protection over the next few years in the departments (bureaus) of chemical industry of the provinces, cities, autonomous regions and key enterprises. On the other hand we contacted the subsidiary chemical industry academies and asked them to quickly train a teaching force in environmental protection, to establish staffs in environmental protection in the chemical industry and to establish a monitoring staff to include the training of special talent in environmental protection in the chemical industry in the educational plans for the chemical industry. Last year, our ministry negotiated with the Hunan Provincial Planning Committee and the Provincial Education Department and all agreed that Xiangtan University should shoulder the task of training special talent in environmental protection in the chemical industry, and a five year agreement was signed. The agreement stipulated that starting from 1980, each year, two classes of students specializing in environmental protection in the chemical industry will be admitted, totaling 70 persons, for a four-year engineering degree. After graduation, the Ministry of Chemical Industry and Hunan Province will employ 50 percent of them. To solve the difficulty of a shortage of teaching instruments and equipment, between 1981 and 1985, our ministry will subsidize the school 600,000 yuan for the purchase of equipment and instruments.

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Briefs

ECOLOGICAL FORUM--Shanghai, 14 Nov (XINHUA)--The national forum for ecological balance was held in Shanghai for five days and concluded on 12 November. The forum was attended by 92 deputies from 22 provinces and municipalities and 24 special fields. They called for efforts to invite ecologists to participate in the work of formulating state construction plans, set up various ecological districts in the country, study the laws governing the overall ecological-economic development, bring the Yangtze River basin under control, correct the ecological imbalance in northern China and summarize the experiences of various localities in achieving a new ecological balance. [Beijing XINHUA Domestic Service in Chinese 1524 GMT 14 Nov 81 OW]

ENVIRONMENTAL PROTECTION ASSOCIATION--The Chinese Agricultural Environment Protection Association was founded in Beijing on 3 October 1981. The establishment of the association is aimed at popularizing knowledge in agricultural environment protection, improving agricultural development ecologically, combating pollution and raising the academic level in the scientific study of the agricultural environment. [Beijing Domestic Service in Mandarin 1200 GMT 5 Oct 81 OW]

YUNNAN ENVIRONMENTAL PROTECTION--According to YUNNAN RIBAO report, on hearing the report on the situation of environmental protection in Yunnan Province, the Kunming inspection group of the Yunnan Provincial People's Congress Standing Committee held: Yunnan Province has done a good job of environmental protection. However, it is still far from meeting the party's and the people's demands. It is necessary to arouse the people's enthusiasm and rely on the masses to grasp this work well. On the morning of 18 September, the responsible comrade of the Provincial Environmental Protection Bureau submitted a report on environmental protection to the Kunming inspection group in which it was pointed out: The province has scored results in controlling pollution. However, pollution problems are still found in the province. After affirming the achievements made by the Provincial Environmental Protection Bureau, the inspection group urged them to adopt an active attitude and grasp key projects in order to do a good job of environmental protection in the province. Wu Zuomin and Xi Congzhen, vice chairmen of the Yunnan Provincial People's Congress Standing Committee, also attended the meeting and spoke on environmental protection work. [Kunming Yunnan Provincial Service in Mandarin 1100 GMT 22 Sep 81 HK]

CSO: 5000/4006-F

POLLUTION-FIGHTING VEGETATION--A number of units including Huanan Botany Institute of the Chinese Academy of Sciences and Guangzhou Urban Greening Committee have worked jointly and selected 35 species of air pollution-fighting plants after a period of research and experiment lasting 8 years. This achievement was appraised and confirmed on the 4th through the 6th this month. This research project was started in 1973. Guangzhou Chemical Plant and Guangzhou Nitrogen Fertilizer Plant, two heavily polluting plants, were chosen as the sites where the pollution-fighting properties of a large number of plants were tested. More than 500 species of tropical and subtropical plants were tested on these sites, subjected to indoor fumigation test, pot-grown and ground-grown on the plant site, and they were compared with the control group grown in a clean environment of a botanical garden. Altogether 35 species of plants including high-mountain banyan, Chinese ephedra, flaring-tail sunflower, aglaia odorata, candlenut tree (Aleurites moluccana) and camphor, which were found to be resistant to harmful gases such as chlorine and carbon dioxide, were selected. At the same time this research work was underway, the two industrial plants which were used as test sites also undertook positive measures to treat their three wastes. As a result, the appearance of these two plants has been completely renewed. The plant sites are now decorated with lush green trees, grasses and blooming flowers. During the process of studying the pollution-fighting plants, the Huanan Botany Institute successfully developed and constructed China's finest air pollution laboratory. Using this laboratory, a microscopic study of the pollution-fighting ability of various plants could be carried out and provided scientific bases for the selection of the pollution-fighting plants. [Article by Zhang Tingchun [1728 1694 2504] and Zhang Guoguang [1728 0948 0342] [Text] [Beijing GUANGMING RIBAO in Chinese 12 Nov 81 p 1] 9113

CSO: 5000/4010

LEGAL HANDLING OF POLLUTION CASES OUTLINED

Arbitration Agency Planned

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 4, 1981 pp 13-15

[Article by Luo Dianrong [5012 0368 2837], Deng Jianxi [6772 1696 3356]: "Establish an Environmental Arbitration Agency; Strengthen the Building of a Legal System"]

[Text] The present legal system for environmental protection is not sound. The building of a legal system needs to be strengthened. Establishing an arbitration agency and handling cases of dispute over pollution according to arbitration procedures and according to related laws and regulations are an important step in making the legal system for environmental protection sound.

The Development of the Objective Situation Requires the Establishment of an Arbitration Agency for Environmental Protection

In recent years, disputes caused by environmental pollution have occurred from time to time. They not only cause economic and property loss by the state and the collectives, they have also affected the productive and social order and have intensified the internal conflicts of the people and affected stability and unity and the building of the "four modernizations."

In the past, such disputes were mainly handled through administrative channels, and we relied on administrative means to solve them. Some disputes that have been solved by negotiation between two parties had to be approved by the local party and political departments. Such methods of handling disputes have the following shortcomings: One is that they do not suit the objective demands for making the legal system sound. The handling of cases of disputes over pollution should be carried out according to legal procedures, according to investigated facts, according to law, legal decrees and related regulations by special agencies established by departments in charge of environmental protection duties. Relying on administrative means and relying on the decision and approval and comments of a few leaders easily leads to a situation where personal opinion replaces the law and legal decrees. The second is that this easily creates confusion of facts, confusion of responsibility and inappropriate punishment. This is because during the course of handling disputes over pollution by administrative means it is not possible to follow definite legal procedures in which a complaint is lodged and accepted, there is a survey of the scene, an investigation, mediation, arbitration, and implementation. Frequently. there are complaining units or plaintiffs without a complaint document. The accused unit does not have a reply, there are no investigative reports, there are no written records of surveys of the scene, arbitration agreements or decisions of arbitration are not considered official documents with legal power etc. Investigation and handling of cases in this way easily leads to listening to and believing only one side of the arguments, subjective presumptions, and prejudgments. Agreements through mediation and decisions of arbitration do not follow legal procedures; there are no officially legal documents or written records; they lack legal binding power; and it is difficult to pursue those who violate the agreement or the decision of arbitration. This situation is even more serious especially in negotiated settlement between the polluting unit and the unit suffering damage. Because the facts become confused, it is not only difficult to determine legal responsibility, sometimes it also creates a reversal of primary and secondary [issues]. At the same time, because there is no special agency to handle cases of environmental disputes, the plaintiff has to lodge his complaint in many places, and attitudes differ from unit to unit, making the case more complex. This also forces the party and administrative departments at each level to get bogged down in daily affairs while the environmental protection departments are busy going here and there, issuing documents, writing reports, thus effecting the enthusiasm of the functional departments. Also, not following definite legal procedure makes it very difficult to legally clarify responsibility and to truly convince the disputing parties, and as a result, during the course of mediation, both parties sometimes reverse their argument, preventing mediation from reaching a conclusion. This not only affects the quality of handling cases, it also wastes a lot of time and consumes a lot of manpower and material. The third is that mediating and handling pollution cases through administrative means does not suit the demands of reforming the economic management system. The current economic management system is characterized by the fact that the enterprises do not have much authority over personnel, finances, property, production, supply, transportation and marketing. Financially, they are under unified income and unified expenditure, the enterprises "eat from the big pot," the income and expenditure of the enterprises and the benefits of the workers are not linked together much, and the workers do not care how much the enterprises have to pay in compensation for pollution. After the economic management system is reformed, the practice of "eating from the big pot" must be changed. The financial expenditures of the enterprise and the benefits of the workers will be closely related. Violation of the benefits of the enterprises will directly affect the benefits of the workers of that enterprise. Obviously, the use of administrative means and the use of public funds to resolve disputes cannot work anymore. Also, after each enterprise acquires greater authority over personnel, finances, materials, production, supply, transportation and marketing, the higher level managerial departments will not be able to represent the subordinate enterprises in handling affairs involving the benefits of the enterprises and the benefits of workers. Therefore, as the economic management system is reformed, the ways and methods of handling disputes over pollution will have to be changed correspondingly.

Then, should cases of disputes over environmental pollution be entirely taken up by the courts? Whether we view this from the standpoint of the number of cases or the capacity of the courts themselves, this is very difficult. Also, viewing the nature of the cases themselves, they all belong to the internal conflicts of the people, and in our nation, civil disputes are mostly handled and solved by each unit, each street mediation committee, and only a few cases that are more difficult are solved through the courts. In addition, cases involving pollution have a broad scope, they are highly technical and they have a strongly policy oriented nature, and the courts themselves do not possess the means of monitoring. Therefore, the courts should not and actually cannot take up all cases of disputes over pollution.

In view of the above situation, we believe this task should be borne by the environmental protection departments. This is because: 1. According to stipulations of the Environmental Protection Law, environmental protection departments are the functional departments of environmental protection. They have the undeniable responsibility to implement and execute the Environmental Protection Law and to handle cases of disputes over pollution; 2. The environmental protection departments themselves possess monitoring means and this provides direct and convenient conditions to handle the work; 3. In the past, handling of such cases has always been borne by the environmental protection departments.

The Nature, Duties and Establishment of Arbitration Agencies

The arbitration agencies for environmental protection suggested are arbitration agencies established within the environmental protection departments to correctly handle disputes caused by pollution, to assure the legal benefits of the parties in the dispute, to promote unity, and to promote production. The arbitration agencies for environmental protection should engage in primary arbitration. If the parties in the dispute disagree with the arbitration, they can appeal to the people's court at the same level. If they disagree with the decision of the court, they can still go to a higher people's court for appeal. In this way, as far as legal procedures go, confusion of facts, confusion of responsibility, improper use of the law, and mishandling can be avoided, so it would not be necessary to resort to retrial and a second arbitration. The environmental protection departments of the wards of counties (cities), and of cities under provincial jurisdiction and wards of cities directly under the jurisdiction of the central government can establish arbitration groups and the chief of the environmental protection departments of the counties and wards can serve as group president. In the environmental protection departments of cities directly under provincial jurisdiction and prefectures and cities directly under the jurisdiction of the central government, arbitration groups can also be established consisting of managerial, technical, control and monitoring personnel under the leadership of the chief of the environmental protection bureaus (offices). The jurisdiction in deciding the cases should be according to the subordinate relationship of industrial and mining enterprises. The cases are to be accepted by the arbitration groups of the environmental protection departments of the wards of counties (cities), cities directly under the jurisdiction of the central government and cities under provincial jurisdiction. The disputes over pollution produced by the industrial and mining enterprises subordinate to the ministries (referring to the ministries of the State Council), province, prefecture, cities (referring to cities under the direct jurisdiction of the central government, cities under provincial jurisdiction) are to be accepted by the arbitration groups of the environmental protection departments of the prefecture and the city. Zoning the scope of jurisdiction according to the subordinate relationship of industrial and mining enterprises is beneficial to appeal and mediation activities. Cases under the jurisdiction of basic level arbitration groups (i.e., arbitration agencies of the county and ward) which are difficult and which have serious consequences can be mediated by higher level arbitration groups (i.e., arbitration agencies of the prefecture, the city). If one of the parties involved disagrees with the arbitration, he can bring the case to the court at the same level (i.e., mid-level people's court). This facilitates appeal and mediation activities and also allows major cases of pollution to be handled directly by the higher level arbitration groups and the higher level court. The higher level arbitration agencies and the lower level arbitration agencies are related as leading agencies and agencies being led in affairs handled. The lower arbitration agencies are responsible for reporting to the higher level arbitration agencies. The higher arbitration agencies guide the operation of the lower level arbitration agencies. To assure that arbitration agencies complete their tasks smoothly, they should be given corresponding authority so that they can utilize their authority to handle disputes over pollution. The arbitrator should have the right to question the parties involved, related persons, look up related information, investigate the scene, and invite evaluators and technical specialists to serve as arbitration council.

The System and Principles of the Arbitration Agencies

The arbitration procedure is based on the basic principle of arbitration activities. It runs through the arbitration procedures. Only after correctly understanding and utilizing these basic principles can the arbitration procedures be conscientiously implemented and accurately executed. The basic system and principles of arbitration are:

1. Regardless of position and rank, size of the enterprise, whether the unit is a leading agency or a subordinate agency, everyone is equal under the law.

2. Emphasize investigation, study and evidence, prevent listening to and believing onesided arguments, subjective judgments, and preconceptual, idealistic ways of thinking and working.

3. Rely on the masses, insist on the mass line. Not only do the investigation and the gathering of evidence require relying on the masses, but solving the cases must also be placed under the scrutiny of the broad masses so that the arbitrator can seriously and conscientiously handle the case according to law and related policies and regulations and prevent any deviation.

4. Take facts as the basis and the law as the criteria.

5. Take mediation as the main way and arbitration as supplementary. The nature of the cases of dispute over pollution belongs to the internal conflicts of the people. The method of solving the conflict should mainly be mediation. If after many attempts at mediation there is still no result, the method of arbitration can also be used to solve the dispute.

6. Defense and withdrawal. The accused has the right of defense. He can act as his own defense or he can ask a defense council to defend him. If the parties of the dispute believe that the arbitrator handling the case may have acted partially and may have affected the fair resolution of the case, they can request for a change of arbitrator and another arbitrator can be brought in to handle the case.

7. Mediation of disputes over pollution by an arbitration group should all be conducted publicly unless the case involves state secrets and personal and private affairs.

Arbitration Procedure

Appeal: In all disputes over pollution, either party of the dispute can submit an application to the environmental protection arbitration group of the county or ward hearing the cases to request for mediation and arbitration.

Acceptance: Whether the procedures of reviewing the appeal have been completed, a copy of the application must be sent to the accused and he must reply within five days. Whether or not the accused replies, the case will be handled. If both parties of the dispute believe that the arbitrator handling the case is related to the case and may be partial to one side, they have the right to request for withdrawal.

Investigation: This involves questioning the parties involved and persons knowing the details of the dispute over pollution, investigating and clarifying the basic situation of both the plaintiff and the accused, the time, place, cause, happenings, loss, degree of damage, focal point of the dispute between the two parties and technical monitoring of the situation of pollution, surveying the scene, making reports on monitored data and written records of surveys.

Mediation: On the basis of clarifying the facts, the principle of taking mediation as the main way must be insisted upon. The parties involved should be educated in the Environmental Protection Law and related national policies and regulations, and right and wrong must be clarified to guide them towards mutual negotiation to solve the conflict.

Arbitration: If mediation fails, then the arbitration group shall arbitrate. When the arbitration does not involve state secrets or personal and private affairs, it should be conducted in public with participation by the parties involved. The time and place of arbitration must be stated in a written notice issued by the arbitration group to the parties involved. Any party remaining unnotified after three attempts can be absent for arbitration. Both parties of the dispute must appear at the designated time and place to lodge the complaint and to present the defense. The arbitration group must arbitrate according to the Environmental Protection Law and the state's related policies and legal stipulations.

Execution: Decisions on cases already subjected to arbitration shall possess legal power, and their execution is to be supervised and promoted by the arbitration group. If these [decisions] are not executed, the arbitration group can take the necessary and mandatory measures in response to a request by one party of the dispute.

Organizing the files and filing: After a case is closed, the persons in charge of handling the case should compile all the materials produced during the course of handling the case and file them in a case file with a table of contents and paginated.

Return visit: To inspect the results of arbitration, a return visit to the scene of complex cases with far reaching effects should be conducted some time after arbitration to listen to the reactions of the parties to the dispute, concerned leaders and the masses to facilitate summarizing the experience and improve the work.

9296
CSO: 5000/4004

Chemical Polluters Fined

Beijing BEIJING RIBAO in Chinese 13 Oct 81 p 1

[Article by Yang Xiaoling [2799 1420 3781] and Liu Shouchang [0491 1108 2490]: "Significant Results Achieved as a Result of Conscientiously Implementing Fines on Excessive Pollutors; Beijing Units Aggressively Tackle Pollution Problem"]

> [Text] Editor's note: Although it has been only a few months since fines were levied on excessive pollutors in the city, significant results have already been achieved. This proves that it is correct to implement this measure, and the environmental pollution problems can be significantly solved by holding fast to it. We sincerely hope that every leading organization and business unit of the capital will continue to implement this policy, levying fines on the excessive pollutors, fighting side-by-side, in order to achieve even better results in the treatment of the environmental pollution problems of the capital.

Starting in April of this year, the Beijing municipal government levied fines against more than 280 units which polluted excessively. This action has had a persuasive effect, and significant results have been achieved. So far, 10 percent of those who were fined have taken action to treat the problem and the pollution level has been lowered to an acceptable level; they are no longer paying the fines. Twenty-seven percent of the units have set up their treatment programs and are currently implementing these measures; while a small number of units have significantly lowered the level of pollution through adoption of positive treatment measures.

One quick assembly boiler belonging to Beijing Paper Plant No 8 already had dust removal equipment installed for the purpose of combating the pollution problem. The equipment had broken down and had not been repaired. Within a few days after the measure for charging fines against excessive polluters was implemented, they repaired the smoke and dust removal equipment and put it back into operation; now the smoke and dust discharge is well within the standard. While making payment of fines on one hand, Beijing Instrument and Casting Plant took measures to solve the problem. Within 2-3 months it too succeeded in achieving the smoke and dust discharge standard. Tongrentang Herbal Medicine Plant has successfully lowered its plant smoke emission from class 5 to class 1 and thus satisfied the requirement by strengthening its boiler room management and the control of its boiler room operators by including reduction of dark smoke emission as part of their work evaluation. Through this policy, many units began changing their past practices in which only a few cadres were in charge of the environmental protection work. Now the masses as well as the leadership began to take part in solving the pollution problem. Beijing Organic Chemical Plant called a number of meetings of the cadres at various levels of the plant to propagandize the importance of the environmental protection work, to show the concrete requirement, and to point out clearly that whoever pollutes will be held responsible for the cleanup. The plant manager has led the persons in charge of various offices and factories on an on-site inspection tour of the waste water discharge openings. Wherever a problem was found the responsibility for its solution was directly assigned to the concerned unit. So far, they have already taken measures to tackle the problems related to the three factories whose waste water oxygen consumption problem was the most serious. The measures taken included divided flow pollutant removal, waste water recycling and manual cleaning of the kilns.

There are also a number of units with excessive pollution problems but who are so far unable to solve their own problems because of technical backwardness. These units have all launched joint assault with scientific research units. Dongshen Commune Paper Plant and Haiding Paper Plant for many years, could not solve their own pollution problems. They have recently drafted treatment plans in cooperation with the scientific research departments and the universities, and the plans will be carried out soon.

9113
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Symposium in Japan

Tokyo KYODO in English 1003 GMT 25 Oct 81

[Text] Kyoto, 25 Oct, KYODO--A form of poisoning caused by industrial mercury wastes similar to the so-called Minamata disease found in Japan has been discovered also in China, a visiting Chinese researcher on the problem of environmental pollution reported Sunday at a symposium here.

However, Hou Zhaotang, professor at the Baiquien Medical College, told the Japan-China joint symposium that China has taken effective countermeasures to prevent serious damage, taking lessons from the case of Minamata disease.

About 100 Japanese and Chinese researchers are meeting at a hall in Kyoto's Sakyo ward to report on actual environmental pollution conditions in each nation and to exchange views on industrial calamities, occupational diseases and environmental pollution.

The Chinese data showing damage caused by industrial mercury pollution from factory waste water was made public for the first time outside China, a symposium spokesman said.

Professor Hou, member of a mission representing the All-China Federation of Trade Unions, arrived in Japan on 12 October together with other mission members to observe industrial calamities and environmental pollution in Japan.

Hou took part in the symposium after conducting observations in Minamata Bay in Kumamoto Prefecture where industrial mercury once poisoned fish and marine life.

In the 1960's, pollution of the Song Hua River running around the city of Jilin in Jilin Province in China increased due to waste water discharged by chemical factories around the city, Professor Hou reported.

Periodic checks of some 300 people living around the river who ate polluted fish caught in it were carried out between 1973 and 1980. It was found that 19 of them showed symptoms apparently caused by industrial mercury poisoning such as hearing and eyesight disabilities, the Chinese researcher said.

However, the conditions of the victims were comparatively light and any grave condition as seen in the Japanese Minamata disease cases has not been evident so far, the Chinese professor reported.

Professor Hou said that the early checks on the disease carried out in China was the reason for the comparatively light disabilities of the victims, and that the report on the Minamata disease in Japan enabled China to check the mercury pollution at an earlier stage.

CSO: 5000/4008-F

Spokesman Denies Radioactive Leaks Report

Hong Kong AFP in English 0956 GMT 31 Aug 81

[Text] Beijing, 31 Aug (AFP)--A Chinese government spokesman today denied foreign press reports that there had been radioactive leakages at the nuclear testing center in northwestern China's Lop Nor.

"We have learned that this story is not true and purely fictitious" the spokesman said in response to questions.

Last week a report in the London-based FINANCIAL TIMES from Urumqi quoted local officials as saying that radioactive leaks at Lop Nor could be behind an increase in the number of [words indistinct] liver cancer cases in Xinjiang.

Some 208 nuclear tests including several atmospheric ones have been carried out at the Lop Nor site in eastern Xinjiang since 1964.

CSO: 5000/4001-F

WATER POLLUTION CONTROL, CONSERVATION EFFORTS UNDERWAY

Beijing Projects

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 4, 1981 pp 4-7, 18

[Article by Tao Baokai [7118 5508 2818] and Ling Bo [0407 3134]: "Water Resources, Water Pollution and Environmental Sanitation in the Capital"]

[Text] Water is one of the basic elements that make up the environment. Therefore, to build Beijing into a first class city with the cleanest, the most sanitary and the most beautiful environment, it cannot be without sufficient and clean water. But, as industrial and agricultural production develop rapidly and with the high concentration of urban population, there is an extreme shortage of water resources in Beijing. On the one hand, untreated dirty water flows through underground waterways and exposed ditches and seeps into wells to pollute ground water and surface water, directly polluting the environment of the capital and seriously affecting the people's daily life. On the other hand, the work of environmental control in the capital cannot catch up, environmental sanitation work is not forceful, thus affecting the rational development and utilization of water resources. Water resources, water pollution and environmental sanitation are inseparably related, and they should be considered in a uniform manner. In the following, some general views concerning the problems in these three aspects in Beijing are presented.

Beijing Is a City With an Extreme Shortage of Water Resources; It Must First Consider Conservation of Water

Information shows the replenishable reserve of groundwater in Beijing averages about 3 billion tons a year, and the amount of surface water which can be utilized in a year with a normal amount of water is about 2 billion tons, but only 1 billion tons during a dry year, and at present, the consumption of water in the city has already gone over 4 billion tons. During a dry year, there is a very serious shortage in the supply of water.

The groundwater as the main source of the water supply for Beijing has been overly exploited for many years, and the present underground water level drops 0.8 to 1.0 meters a year. Many of the water wells of the Beijing Water Company have already been abandoned, and some wells must change to the use of deep well pumps to extract water. Beijing City and the suburban region have already formed a

1,000 square kilometer funnel region with a dropping water level. The water level drops an average of 3 to 4 meters, and the greatest drop in the central region has reached 20 meters. In view of this, water resources in Beijing at present are already facing a serious crisis. At the same time, because the drop of the groundwater level has caused the sinking area of the ground surface to expand year after year, city construction has been endangered.

Surface water from the upper reaches also constitutes a definite portion of the water supply of Beijing. But its assurance has lowered day by day. For many years, the water in the Guanting Reservoir has dropped continuously, the sources of water at the upper reaches of the Yongdinghe system are almost exhausted, therefore the replenishment of surface water is very unreliable.

Total water consumption includes water for living, water for industrial use and water for agricultural use. The amount of increase in water consumption in Beijing from 1958 to 1975 and the rate of growth far exceeded the rate from 1951 to 1957, and at the same time, the amount of polluted water has also doubled. If this situation is not controlled, then by the year 2000, the total amount of water consumption of the whole city will surpass the current amount of water consumption by onefold.

The way to solve the problem of water resources in Beijing is by developing resources and conservation. Developing resources should mean the full utilization of local water resources, including the building of reservoirs and replenishing ground water, but these methods require massive engineering construction, and they must be carried out according to plan and in steps. The "transferring water of southern surface water systems to the north" is still difficult to realize. Transferring the water of Luanhe to Tianjin to reduce the supply of water to Tianjin by the Miyun Reservoir also requires careful planning and study. Therefore, the key method of solving the present shortage of water resources in Beijing is conserving the flow. Various methods must be used to strictly carry out water conservation.

Among the various uses of water throughout the city, water for agricultural use constitutes 64 percent, water for industrial use constitutes 30 percent, water for urban living constitutes 6 percent. Increasing the percentage of recycling and utilization of current water resources in Beijing and increasing the percentage of reusing and the percentage of retrieval are important ways to solve the deficiency of water resources and the ever-increasing amount of water consumption. Conservation is not only necessary, it also has great potential. In industrial use of water, about 70 to 80 percent is cooling water, but the percentage of recycled use of water in Beijing at present has already reached 50 percent, and this can surely be increased to 70 to 80 percent. This not only conserves water consumption, it also reduces the amount of waste water released by industry. But this must be assisted by legislation and economic sanctions to assure that the recycling and use of industrial cooling water are strictly carried out. Shanghai used economic methods to force factories to implement water conservation. Water fees for exceeding established consumption levels are 2 to 5 times more than the regular fee. Beijing should be more strict than Shanghai because the shortage of water resources in Beijing at present is more serious than in Shanghai.

We believe besides doubling the water fees, we can also fine those industrial units and enterprises that do not recycle cooling water. In addition, sinking wells in the city limits must also be strictly controlled. In this regard, the city not long ago issued clear regulations. This is very good.

Farmland irrigation must use new techniques, and scientific management must be strengthened. At present, flooding irrigation is used to irrigate the land. Each year, each mu uses an average of 600 cubic meters, which is very wasteful. In addition to the need to improve the method of irrigating ground surfaces, popularize sprinkle irrigation, drip irrigation and reform the irrigation system, we also need to strengthen the management of using the city's polluted water for irrigation and the treatment of polluted water. Although polluted water is a source of pollution, it is also a water resource. Under certain conditions, treated dirty water can be retrieved and utilized again. Dissolved mud can produce methane--utilizable energy. Also, using dirty water for irrigation over large areas can conserve agricultural use of water and can also provide a source of fertilizers and reduce pollution. We must insist on strictly implementing the regulations of "the three simultaneous tasks," newly built enterprises or newly built facilities must simultaneously build engineering facilities to protect the environment during the course of design and construction, but there are still many units that do not emphasize this point.

The Water Resources In Beijing Have Been Seriously Polluted. This Must Be Actively Controlled. Environmental Protection Must Be Combined With Municipal Construction

According to information and reports of the city, in 1978, the total amount of polluted water of the whole year in Beijing reached 640 million cubic meters. Over 80 percent of this amount flowed directly into the river, but only 18 percent of wastewater and polluted water entered the polluted-water pipe network and pumping stations, and the final amount of polluted water that entered the primary treatment plant constituted only 7.5 percent, about 48 million cubic meters/year. Therefore, over 90 percent of the whole city's polluted water and wastewater were directly released without any treatment. The amount of polluted water in New York subjected to treatment constitutes 78 percent and that in Tokyo reaches 88 percent, and all these amounts were treated by secondary treatment plants.

Of the whole city's polluted water, about 40 to 50 percent comes from water polluted in household utilization, and 50 to 60 percent is polluted water from industries. The polluted water entering the underground sewage contains characteristics of both polluted water from homes and industrially polluted water. It contains large amounts of bacteria and roundworm larvae and organic matter of easily decomposable human excrement. It also contains synthetic detergent, xylem and other poisonous organic matter and heavy metals that do not decompose easily. The amount of natural dust in Beijing is very large, and with pollution from burning coal, traffic, industrial waste and garbage from households, which are all washed into the rivers by runoff from heavy rains during the rainy season, the content of suspended substances and the content of organic matter in surface water have visibly increased. Certain heavy metallic elements such as lead also increased. Farm chemicals mainly of organic nitrogen flowing into the rivers via regional runoff are also a source of water pollution.

Pollution of the surface water system is serious. The content of dissolved oxygen in many river channels is low (0.1 to 8.8 milligrams/liter), the content of BOD and COD is high (the highest content of BOD reaches 229 milligrams/liter; the highest COD content reaches 1115 milligrams/liter). Strong oxygen consuming processes and biological degradation processes of poisonous organic matter exist in the rivers, therefore there are no traces of growth of large aquatic life in the rivers.

In the mud of the river bed, there is a visible concentration of heavy metals such as mercury, lead and cadmium. In addition, relatively serious pollution by salt, pollution by nitrogen and pollution by bacteria have occurred. In some river sections there is also thermal pollution.

Periodic monitoring of the water-rich period and dry period of groundwater in the suburban areas of the entire city shows low detection percentages of mercury, chromium, arsenic, oxygen consumption and low surplus percentages, but the detection percentages and surplus percentages of phenol, cyanogen, ammonia and nitrogen, nitrates and total hardness are all high.

Among these indicators, the large area increase of the hardness of groundwater is an important indicator of the worsening quality of groundwater. During the past 20 years, the hardness of the groundwater in Beijing has continued to rise, and especially during the last ten years its rate of increase has been even faster. Monitoring results taken in 1977 showed the hardness of the water produced by the Shuiyuan No 7 Plant was 29.1, an annual rise of about 0.9; that of Shuiyuan No 4 Plant was 25, an annual rise of about 0.5; that of Shuiyuan No 1 Plant was 11.5, an annual rise of about 0.45. Hardness is the highest in the area near Longtanhu at the southeast corner of the city. Hardness of the water in individual wells can exceed 80. Organic matter in the soil and organic substances in polluted water from city life and garbage in the city that can be biologically degraded are sources that produce CO_2. According to measurements of the content of garbage of the cities in the southern suburban areas, the amount of decomposed CO_2 in each kilogram of garbage was 140 milligrams, onefold more than that in fertile soil, and 70 times more than the content of CO_2 in one liter of atmospheric rainfall. The massive amount of CO_2 has provided conditions for the dissolution of $CaCO_3$ in the soil, and is also the main reason for the temporary rise in the hardness of underground water. The saline effect and pollution by salt act mainly to raise the permanent hardness of groundwater. It can thus be seen, besides industrially polluted water and industrial waste, city garbage and human excrement have already seriously polluted the groundwater sources through seepage in wells and exposed waste water canals because of poor management.

When utilizing polluted water for irrigation, we must also consider the pollution thus caused, for example, the propagation of bacteria and virus and the long term accumulation of toxicity of organic matter that are hard to degrade. The Gaobeidian Polluted Water Treatment Plant is at present Beijing's only large primary treatment plant. It treats polluted water from households and also treats industrial waste water, and it uses the polluted water to irrigate farmland. At present, there are different opinions concerning the planning and design of that plant. Some people advocate the use of two level treatments and the treatment of mud. Other people advocate the temporary use of primary treatment first and digestion of mud to produce methane at the same time. The equipment cost and the amount of electricity consumption for secondary treatment are high. To reduce equipment cost and conserve energy, what would be the effect of primary treatment upon the irrigation of farmland? Biological ponds take up large areas, but compared to the cost of secondary treatment facilities, we should say they are still economical. Is it possible to use biological ponds to treat polluted water and then use the water for irrigation of farmland? Should the exit of waste water after treatment be channeled into Tonghui River or into other rivers? These are all questions of debate. We believe concerned units should be called to discuss and study and, when necessary, conduct experiments to consider whether second level treatment can be completed in stages? If we use primary treatment and supplement it with biological ponds and irrigation with polluted water, the equipment costs could be greatly conserved, and we could start construction of such treatment plants as the Zhenwangfen Polluted Water Treatment Plant.

In summary, water pollution in Beijing is serious. To protect water resources, we must control water pollution. The control of water pollution first requires focusing on the combination of environmental management and prevention and control, and using management to promote control. Summarizing the experience and lessons of environmental protection work at each locality, it can be seen, without regional comprehensive control plans, environmental management will be difficult to arrange rationally. Units producing "three wastes" frequently care only about releasing wastes but do not care about control. This situation of setting production against environmental protection must be changed.

The self cleansing ability of a body of water is also a type of water resource. If we can fully utilize the self cleansing ability of bodies of water, then it would be a symbol of the coordination between the rational utilization of water resources and effective control of water pollution. But the self cleansing ability of a body of water is limited, and when its capacity is surpassed, a river of clear water will become a dirty water ditch. Therefore, a definite right of utilization should be rationally assigned to polluting units according to their pollution load, and they should be required to pay corresponding fees for the utilization--exploitation of water resources and the release of pollutants to stimulate each type of industry to manage polluted water.

The guideline of combining prevention and control and using management to stimulate control should be based on the basic theories of environmental science and the study of its application to establish policy and systems for environmental management. The aquatic environment is a comprehensive system with many elements and many media. The environmental factors are frequently mutually limiting and mutually related. Therefore, on the basis of doing a good job of evaluating environmental quality and pre-evaluations, we should establish models of the various processes in the aquatic environmental system and use the method of optimization to analyze the various possible states of change in the system so that the massive amount of monitored and measured environmental data can be systematized, and so they can be made dynamic and provide environmental management with a scientific basis and foresight through regulation, control and forecasting. For example, the present problem of pollution of the rivers by industrially polluted water, polluted water of agriculture and polluted water of cities is not a localized problem anymore. Frequently it involves the entire water system.

To control water pollution, to manage the water quality in rivers, to design the polluted water treatment plants of each level economically and rationally to satisfy the demands of the goal of an aquatic environment, it is necessary to plan the water quality of the water systems. But the control of water pollution cannot rely only on the evaluation of environmental quality, systematic analysis and the study of regional planning and control to establish management measures. It must also rely on the design and construction of municipal construction projects before it can be realized. The research results of environmental systems engineering provide information for the planning and design of municipal construction projects so that the design of municipal construction projects are more technically feasible and more economically rational. Yet, we should see that during the recent 30 years, Beijing's municipal construction projects, such as the network of pipes for polluted water, polluted water pumping stations, polluted water treatment plants and such projects of construction and the treatment plants and such projects of construction and the treatment of Longxugou and the construction of the underground sewage at the beginning period of liberation have served importantly to improve water pollution in Beijing. In the future, if the planning and design of municipal construction projects and the study of environmental science and systems engineering can be combined, then the control of water pollution in Beijing will be more effective. For example, the environmental quality evaluation of the southeastern suburb of Beijing City and the systematic analysis using BOD_5 as the indicator were very good tests. They have a great reference function in the control and planning of water pollution in our nation. But it must also be pointed out that in this work, many indicators for the overall analysis of treatment of polluted water are still lacking, and they have not been combined with the already existing plans for that region's municipal construction to draw up an optimal design and plan. We believe that the optimal planning of pipe systems, pumping stations, polluted water treatment plants and water systems should require that the municipal construction workers and environmental science workers get together and cooperate. Only in this way can environmental quality evaluation and optimal planning become reality. We hope that the present situation of noncommunication between the two sides can be bridged in many ways, such as academic exchange and cooperation in subject research to change the situation. In particular, Beijing city's municipal construction engineers all have rich experience, and their rich experience should be combined with the method of optimal analysis of environmental systems engineering.

Beijing City's Environmental Sanitation Must Be Greatly Improved, Municipal Construction Must Be Combined with Environmental Sanitation

Because Beijing City's municipal construction is far behind schedule, because the pipelines for polluted water are not complete, and because leakage of the old ditches of the city is great, human excrement and garbage have not been properly treated. The polluted water of the city's 10,000 polluted water wells is also drained into the old ditches, seriously polluting the groundwater. Public lavatories are dirty, human excrement overflow and underground sewage frequently is stopped up. These problems directly affect the life of the residents, and the broad masses have strongly demanded concerned departments to rapidly take measures to exert efforts to improve the environmental sanitation of the capital. In addition, there will be no more space to pile up Beijing's garbage. Because the garbage contains too much dust and residues, the people's communes do not welcome the use of this type of garbage to fertilize the fields.

According to our understanding, in Beijing, the treatment of human excrement and garbage are all duties of the city's Environmental Sanitation Bureau. Garbage collectors are not afraid of filth or fatigue. They work day and night to serve the people. The street sweepers, garbage trucks, sprinklers and garbage cans designed and manufactured by technical personnel have all served well in protecting environmental sanitation in the capital. Recently, the West Town Ward Environmental Sanitation Bureau accepted the proposal of the people's representative and did some work to clean up garbage and fix up the lavatories. Wangfujing Boulevard plans to build a large public lavatory. These all show the Environmental Sanitation Bureau has gradually paid attention and has improved the treatment of human excrement and garbage in the city. We believe it is now necessary to conduct a general survey of the measures of treatment of the city's public lavatories, seepage wells, adjoining underground sewage and garbage, propose plans on how to design and manage public lavatories well and to carry out reforms in stages, and formulate plans on how to do the work of treating human excrement and garbage well, and at the same time, carry out scientific experiments and strengthen propaganda and education of the masses. This work is the duty of the environmental sanitation department. But the planning department, the municipal construction department and the municipal design department should also cooperate in planning and designing construction projects well. We believe, in the near future, we need to rebuild the public lavatories in the city and strengthen management, establish facilities for periodic washing, eliminate seepage wells gradually and systematically. In the long term, we must separate the flow of rain water and polluted water so that the old ditches are only used to drain rain water. In the rural areas, we must study the creation of compost heaps using human excrement, garbage and agricultural wastes to provide methane. Only by including environmental sanitation work in the daily agenda and under the close cooperation of concerned units can the present situation of serious pollution be changed. Only after environmental sanitation has been improved can the protection of water resources and the control of water pollution be assured.

To find a way of controlling pollution that does not cost much and that produces real results, scientific research must come first. We cannot be limited to environmental monitoring, environmental quality evaluation and control techniques, we should also include plans for comprehensive control in many ways, such as the important method of purification using oxidation ponds of symbiotic systems of fungus and algae, the study of making compost heaps from human excrement and waste to providing methane, and the study of the patterns of distribution and the emergence and disappearance of pollutants in irrigation using polluted water.

Viewing the course of development of water resources management, control of water pollution, and improvement of environmental sanitation in industrially developed nations, the establishment of an agency in Beijing to control water and environmental sanitation and to [illegible] out regional comprehensive management is necessary for implementing the gui[illegible] of combining prevention and control and using management to stimulate control. The leadership of Beijing at present has emphasized the problem of water resources. We hope that the mayor will lead in the establishment of a strong agency, establish a committee on water resources, water pollution and environmental sanitation and include it in the city's general plans for the prevention and control of water resources, water pollution and environmental sanitation so that Beijing can become the city with the cleanest and the most beautiful environment.

9296
CSO: 5000/4004

Beijing Addresses Drainage Problems

Beijing BEIJING RIBAO in Chinese 30 Sep 81 p 1

[Article by Li Jianqiang [2621 1696 1730]: "To Solve Problems of Overcrowded Traffic and Poor Drainage, Construction of A Group of the City's Backbone Construction Projects Is Hastened"]

[Excerpt] To solve the problem of poor drainage in the city, each concerned unit is putting heavy stress on projects to treat Qinghe and Changhe, Beihuchenghe, and Liangmahe. Qinghe and its tributaries Wanquanhe, Xiaoyuehe, Changhe, Beihuchenghe, Liangmahe and Bahe are the major drainage rivers in the northwestern part of the city flowing towards Wenyuhe. For many years, a large amount of polluted water has flowed into the rivers, the river beds are silted and blocked, and drainage is poor. Whenever there is a big rain, many wards accumulate water and have floods. River treatment projects include dredging the river channels, repairing protective banks, repairing roads along river banks, building bridges and building pipelines to intercept polluted water. At present, the 16 kilometer long river channel from the lower reaches of the Qinghe from Qinghezheng to Wenyuhe has already been dredged. A pipeline of 3 kilometers to intercept polluted water entering the Changhe has already been built. Two kilometers of the river channel along the 7-kilometer long Beihuchenghe above Songlinzha have been treated. The pipeline lying on the south side of the river channel to drain polluted water has also been completed. The river channel of 2.5 kilometers of Liangmahe from below Tuofangying to Bahe has been treated. The river channel of about 5 kilometers from above Tuofangying to Dongsanhuan has been dredged in a simple way, 12 bridges and 5 kilometers of road along the river bank have been constructed. After completion of the projects of treating these rivers and the building of corresponding accessory facilities, the drainage problem in the northwestern part of this city will be basically solved. At the same time, through measures to intercept the flow of polluted water, building of floodgates to store water, and greening efforts, the water quality in the city's lakes, such as Jishuitan, Houhai and Beihai will improve.

To solve the problem of draining the city's polluted water, the city's construction department is putting considerable effort into the repair and building of several large scale sewer projects. Of these, the pipeline project from Erligou via Ganjiakuo, Muxidi to Liangshuihe is a trunk line in the western suburb. After completion, it will serve as an outlet for the city's polluted water of the area west of the line from Sizhimen to Guanganmen. At the same time, it can also improve the underground water quality of the Jingxi waterhead. The sewer from Zuoanmen to Tonghuihe extending 4 kilometers now being built is the trunk line of Nancheng. After completion, the polluted water of the southeastern ward will not have to be drained into the Huchenghe.

9296
CSO: 5000/4005

Wuhan Research Association

Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVANCY AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 11, Nov 81 inside back cover

[Article provided by Gao Jianqing [7559 0494 3237] of the Environmental Protection Office of the Water Conservancy Ministry: "The Environmental and Water Conservancy Research Association of the Chinese Water Conservancy Society Is Founded in Wuhan; The Water Conservancy Ministry Holds Water Conservancy Research Classes in Wuhan"]

[Text] To further environmental and water conservancy work, the Water Conservancy Ministry held an environmental and water conservancy research class in Wuhan from 7 to 22 October and held the founding meeting of the Environmental and Water Conservancy Research Association of the Chinese Water Conservancy Society.

Over 100 delegates from the water conservancy departments (bureaus) of provinces, cities and autonomous regions, design and scientific research units subordinate to the ministry and universities and colleges participated in the research class. The research class studied the key problems concerning the relationship between water conservancy projects and the environment, environmental impact and evaluation of water conservancy projects, control of the environmental impact of water conservancy projects and the necessity, possibility, rationality of measures of control, relationship between water quality and water quantity and measures that should be taken to protect water quality. On this basis, a document entitled "suggestions for regulations concerning the evaluation of environmental impact of water conservancy projects" was formed.

After the research class, the founding meeting of the environmental water conservancy research Association of the Chinese Water Conservancy Society was held. Over 130 people attended the meeting, including comrades participating in the research class and invited specialists, professors, scientific and technical workers and journalists. Deputy Minister of Water Conservancy and Deputy Director of the Chinese Water Conservancy Society Comrade Chen Gengyi [7115 6342 0308] attended the meeting and spoke.

Comrade Chen Genyi said in his speech: Because of the development of construction for production, water conservancy work faces many new problems. Not only has the need for water increased, the conflict between supply and demand is also becoming more and more outstanding, and water conservancy problems related to the environment have emerged. At present, they are mainly manifested by the following:
1. the environmental ecology problem caused by polluted water quality due to the release of massive amounts of dirty water by industry, agriculture and the cities; 2. the environmental ecology problem caused by the changed hydrological, hydraulic and hydrochemical conditions after building water conservancy projects. Water conservancy projects regulate runoff, eliminate natural disasters of drought and floods, and fundamentally speaking, they improve the environment. But, changes in the conditions of the water environment, changes in silting and alluviation in river channels, secondary salinization, induced earthquakes and flooding have also brought about unfavorable environmental ecological effects. If we do not have a sufficient understanding of this, if we do not handle these problems properly, the success or failure of the projects will be affected. Since the beginning of the

1970s, the problems of environmental water conservancy have attracted more and more attention. Adapting to the development of the situation, the Water Conservancy and Electric Power Ministry demanded that we care about water quality as well as quantity in 1975. Later it asked that attention should be paid to the environmental ecological effects in building water conservancy projects. In 1978, it approved the establishment of the "Scientific Research Institute for the Protection of Changjiang Water Sources", the "Scientific Research Institute for the Protection of Huanghe Water Sources," the "Environmental Water Conservancy Scientific Research Institute of the East China Water Conservancy Academy" and gradually launched the work of monitoring, evaluating and managing water quality nationwide, and it carried out the large water conservancy projects of Sanmenxia, Danjiangkou, Gezhouba, the planning and design of transferring southern water to the north, the Sanxia and Xiaolangdi projects, and the work of evaluting the environmental impact of the projects to exploit the water resources in the regions of Hebei, Xinjiang and Yunnan. Environmental water conservancy work is the deepening and the development of water conservancy work. Environmental and water conservancy research mainly deals with the relationship between water conservancy and the environment, the evaluation and the control of environment effects resulting from the exploitation and utilization of water resources by one project, one river valley and within the whole nation, changes in water quality and the effects, and evaluation and comprehensive prevention and control. Therefore, this is a question of the large system, it is a strategic question, its characteristics are that it spans departments, it is multidisciplinary, and it is strongly comprehensive. The perfection of its theory and method requires the mutual coordination and common efforts of related sciences and scientific and technical workers. The purpose of founding the Environmental and Water Conservancy Research Association of the Chinese Water Conservancy Society is to strengthen communication between workers of related sciences and the broad number of scientific and technical workers, promote the development of environmental and water conservancy science to contribute to the development of water conservancy, environmental protection, improvement of the ecology, to benefit mankind and to realize the four modernizations.

The meeting discussed and passed the charter of the Environmental and Water Conservancy Research Association of the Chinese Water Conservancy Society, created the board of directors, discussed and passed the document "Suggestions of Regulations Concerning the Evaluation of the Environmental Impact of Water Conservancy Projects," and established the plans for the activities of the research association.

The board of directors of the Environmental Water Conservancy Research Association of the Chinese Water Conservancy Society consists of 56 members, Comrade Chen Dongming [7115 2639 2494] is board director, and comrades Ye Yangmei [5509 2254 4168], Zhang Shunong [1728 2579 6593], Wang Heting [3769 7729 0080], Su Xiangda [5685 5046 6671], Yao Bangyi [1202 2831 5030], Zhang Xianhong [1728 2009 1347], Cai Hongdao [5591 1347 6670], Fang Ziyun [2455 1311 0061], Shen Ganqin [3088 0984 0615] are deputy directors.

9296
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Bacteria Used in Wastewater Treatment

Shanghai JIEFANG RIBAO in Chinese 21 Sep 81 p 1

[Article by Tang Fubao [0781 1788 0202] and Chen Xinxiang [7115 2450 4382]: "Shanghai Petrochemical General Plant Makes Use of Bacteria To Treat Wastewater"]

[Text] The Shanghai Petrochemical General Plant has succeeded in treating acrylic fiber wastewater with bacteria. This new wastewater-treatment method developed in China has recently passed technical certification [requirements].

In the production process of acrylic fiber, the industrial wastewater discharged has a high concentration of sodium thiocyanate. It not only corrodes pipes and equipment but also jeopardizes fishery resources and the health of the population. Ever since the Shanghai Petrochemical General Plant began production of acrylic fiber a dilution method had been used to treat the wastewater whereby 50 tons of fresh water were added to every ton of wastewater before it was discharged. In this method, not only the absolute quantity of sodium thiocyanate wastewater remained the same, but great amounts of water and energy resources were wasted. To solve this problem, with assistance from the Institute of Microbiology of the Chinese Academy of Sciences, people at the plant have traveled all over China and collected more than 200 species of bacteria that can reduce or eliminate sodium thiocyanate. After more than a thousand culture growths, measurements, and selections a group of bacteria that consume high-concentration sodium thiocyanate was finally found; it was named "SAT 13."

After a year of application, the "SAT 13" strain was found to be capable of eliminating not only sodium thiocyanate but also other organic pollutants in the wastewater. In addition, only simple treatment facilities are needed, the management is straightforward, and it costs only 6.5 fen to treat 1 ton of wastewater.

9698
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Cleaning Up Pollution at Baiyangdian

Shijiazhuang HEBEI RIBAO in Chinese 30 Oct 81 p 3

[Article by reporter Yin Zheng [1438 6927] and correspondent Bai Feng [4101 6265]: "Successful Results Obtained From Research Into Baiyangdian Water Pollution Problem and Measures To Control It"]

[Text] Requested by the State Scientific and Technological Commission, the provincial science commission and environmental protection office have jointly held a meeting recently to authenticate the results of a scientific research project concerning the Baiyangdian water pollution problem and measures to control it.

Attending the authentication meeting were 72 leaders, experts, professors, science and technology workers representing 44 units including the concerned central government units such as State Scientific and Technological Commission, Chinese

Academy of Sciences, Ministry of Geology, Ministry of Water Conservancy and universities in Beijing and Hebei areas; the concerned departments of the municipalities of Beijing, Liaoning, and Baoding and Anxin County of Hebei Province. The authentication work was organized and conducted jointly by the authentication leading committee and the authentication committee consisting of 16 experts, professors, and science and technology workers.

Baiyangdian is one of China's major aquatic product bases in the Huabei area, with important natural, ecological and economic values. Since the 1960's, its waters have become seriously polluted by the waste waters discharged from the industries and the cities situated upstream. In addition, repeated drought in recent years experienced by the area wrought havoc to the aquatic biological resources of the lake. In 1974, the leading comrade of the central government issued an important directive concerning the Baiyangdian water pollution problem and brought forward measures for treating the pollution problem based on the following guideline: "Treat the pollution at the source; isolate the lake pollution; make dams for irrigation purposes; and turn harm into profit." The State Scientific and Technological Commission has set up "Baiyangdian water resource protection research" as an important national scientific research project and assigned this province the task of carrying out the operation. With support from the Chinese Academy of Sciences, the Environmental Protection Office of the State Council, and other concerned central government units, a Baiyangdian water resource protection research cooperative group consisting of 36 units was established in 1975. This cooperative group has carried out, over the pass several years, an extensive survey of the 11 rivers and 9 counties and cities situated in the drainage basin of Baiyangdian which covers more than 300,000 square kilometers in area. This survey was centered around the water pollution problem of Baiyangdian, with special attention paid to the industrial pollutants, aquatic living bodies, irrigation with polluted waters, human health, and with an overall research into the water quality monitoring technology and a general way of treating the industrial waste waters. Through this effort, more than 25,000 statistics have been collected and more than 70 special topic research reports have been published in stages. They continued to process and analyze this data for 2 more years in the laboratory and finally came up with the "Baiyangdian Water Pollution Problem and Its Control Process Research Report." The report described clearly the causes for water pollution at Baiyangdian; it analyzed the laws governing transfer and transformation of various harmful pollutants; it provided scientific bases for the treatment of the pollution problem; it laid out a concrete control process consisting of "treatment above, utilization below and dredge above, control below." The report recommended that a Baiyangdian water resource protection zone be established in order to restore Baiyangdian's ecological environment step-by-step and to prevent further pollution. It proposed that a Baiyangdian drainage basin water quality monitoring network be established in order to monitor regularly the waste water, the reservoir water, the river water and the lake water. It recommended that a Baiyangdian drainage basin water resource protection organization be established in order to implement systematic management of the pollution control engineering work. It has further proposed that a Baiyangdian production management system be established in order to draft economic policies beneficial to the development of the fishing industry and production.

The representatives who attended this authentication meeting analyzed and evaluated the theoretical standard, the academic significance, and the practical application value of the report. They made on-site inspection of Baiyangdian in person and finally approved the Baiyangdian water resource research cooperative group and its research results with sufficient assurance and scientific valuation.

9113
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Abstracts

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TITLE: "Preliminary Survey for Radioactivity Released From Stacks of Coal Fired Power Plants"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese Vol 2 No 5, 30 Oct 81 pp 23-25

ABSTRACT: While many people of the world are objecting to the possible environmental pollution of nuclear power plants the extent of radioactive pollution of the environment caused by power plants using coal as fuel is not yet clarified. Radioactive materials, including uranium, thorium, etc. contained in the coal may be constantly exhausted from the stack and their contents vary with different types of coal. The authors surveyed 4 power plants of Shanghai, involving a total coal consumption of 3 million tons per year. None of them have good dust-removing equipment and about 15 percent of the dust is released into the atmosphere through the stacks, amounting to several hundred thousand tons of dust each year. The ^{238}U and ^{232}Th contents and radioactivity of ^{228}Th, ^{232}Th, ^{226}Ra, ^{238}U, ^{210}Pb, and ^{210}Po of the coal and the coal ash are determined and reported. Attention is called to their harmful effects and adoption of measures to reduce these pollutants is urged.

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TITLE: "Preliminary Analysis of Environmental Problems of Xiangjiang River"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese Vol 2 No 5, 30 Oct 81 pp 25-28

ABSTRACT: Xiangjiang represents a typical subtropical stream of China. It joins 3 other streams in Dongtinghu Lake before entering Changjiang to form a complete water system. From its origin in Haiyang Mountain of Lingchuan County of Guangxi to its entrance at the lake in Xiangying of Hunan, it measures 856 km, with a drainage basin of 94,660 km^2. The basin has a population of 30 million and is among the better developed in the country. In the past several years, 53 points have been established on its main channel and tributaries to monitor the water temperature, pH, conductivity, DO, BOD, COD, amino nitrogen, nitrate nitrogen, nitroso nitrogen, suspended solids, hardness, chlorides, fluorides, phosphates, and E. coli. The major pollution characteristics are found to be (1) Major pollutants are heavy metals; (2) Potential problem of radioactive pollutants; (3) Serious organic chlorine pollution; (4) Other organic pollutants are present although not yet serious. The establishment of mathematical models to study the entire environmental system of the Xiangjiang drainage basin for the purpose of formulating a pollution treatment and control plan is suggested.

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TITLE: "Migration, Transformation, and Fate of Heavy Metals in Xiangjiang River"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese Vol 2 No 5 30 Oct 81 pp 28-35

ABSTRACT: For the purpose of finding ways of controlling water pollution of Xiangjiang, overall surveys have been carried out to determine the heavy metal density of the water and to isolate and analyze its major chemical and physical properties. Survey results indicate that Cd, Pb, Cu, Zn etc. pollution of the water is more severe in some sections and less in others and the major source is the wastewater discharged from the ore mining, washing, and refining processes. The metals of the water are found to accumulate in the sediments and the density of the water and that of the sediment of a given location have the tendency of varying identically from place to place. Each year, with the water of Xiangjiang, about 65.5 tons of Cd, 3449.5 tons of Zn, 2211.1 tons of Pb, and 1553.5 tons of Cu are brought into Dongting Lake.

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TITLE: "Studies on the Chemical Speciation of Heavy Metals Over the Surface of Sediments in Xiangjiang River"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese Vol 2 No 5 30 Oct 81 pp 35-41

ABSTRACT: Under a given condition, the heavy metal ions of water, through ion exchange, cosedimentation, adhesion, hydrolysis, complexing, flocculation, etc. ultimately largely enter the sediments and when the condition changes they may return from the sediments to the water. Depending upon the chemical type, some of the heavy metal contents participate in some of these reactions. In late Jul 79, sediment specimens were taken from each of the monitor stations of Xiangjiang, 30-50m from shore for analyses. Distribution of soluble (I), positive ion exchangeable (II) carbonate bond (III), Fe/Mn oxides (IV), organic (V), Residue (VI) forms of Ge, Cu, Pb, and Zn of the specimens is reported.

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TITLE: "Fluoride Pollution of Wheat in the Suburbs of Baotou, Inner Mongolia"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese Vol 2 No 5 30 Oct 81 pp 47-51

ABSTRACT: Baotou is a city of relatively serious fluoride pollution, with Baotou Steel Mill and Baotou Aluminum Plant being the major sources of fluoride pollutants in the atmosphere. Wheat is one of the major grain crops, occupying about 1/4 of the suburban acreage of 2380 km^2 each year. For this study, specimens of whole wheat plants and 0.5 kg of the topsoil are taken from 74 points for analyses. Based upon a USA report that plants are not harmed when the atmospheric fluoride is 1μg/dm^2 day, areas of that level of density is regarded as pollution-free regions. Wheat harvested from 6 such control areas is checked to arrive at a base value of fluoride content of 0.70ppm. Based upon results of the study, suburbs of Baotou are divided into 4 levels of fluoride pollution: (1) Pollution-free, with an atmosphere fluoride density of $\leq$0.70 ppm and wheat grain fluoride density of 0.49 ppm (1089 km^2); (2) Mildly polluted: 0.71-1.40 ppm in atmosphere and 1.05 ppm in wheat grains; (3) Middle-level pollution: 1.41-2.00 ppm in atmosphere and 1.61ppm in wheat grain; (4) Heavily polluted: > 2.00 ppm in atmosphere and 2.81 ppm in wheat grains (275 km^2 in area.)

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TITLE: "Regional Characteristics of Surface Water in China and Their Pollution Control"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese Vol 2 No 5, 30 Oct 81 pp 71-74

ABSTRACT: The water volume of streams varies geographically and seasonally and this variation obviously influences the density of pollutants. The water temperature and pH are also influential factors. The low average water temperature (below 10°C) of Northeast and North China is unfavorable for the decomposition of phenols and the high pH of the water (above 8.0) of North China caues heavy metals to be easily absorbed and to settle. Based upon variations in soluble oxygen, pH value, chemical oxygen consumption, and phenol, cyan, arsenic, mercury, and chromium contents of the surface water, China is divided into the following regions: (1) the north and east of the Northeast; (2) North China and the southern part of the Northeast; (3) Central China and the banks of Changjiang; (4) South China and the southeastern coastal region. Condition of surface water pollution and pollution control proposals of each of these regions are discussed.

6248
CSO: 4009/172

Briefs

SHANGHAI RIVER POLLUTION MEETING--The week-long discussion meeting on the Huangpu River pollution control planning ended in Shanghai on 4 August. More than 150 experts and other concerned persons from Beijing, Jiangse, Zhejiang, Hubei and Shanghai attended the meeting. It was pointed out at the meeting that a comprehensive and long-range program should be mapped out for control of the river's pollution. At present, the contradiction between the supply of drinking water and the drainage of waste matters urgently needs to be solved. Wang Daohan, mayor; Han Zheyi, vice mayor, and Qu Geping, deputy director of the State Council office of environmental protection leading group, spoke at the meeting. [Shanghai City Service in Mandarin 2300 GMT 4 Aug 81 OW]

CSO: 5000/4001-F

ACHIEVEMENTS, TASKS OF MARINE ENVIRONMENTAL SCIENCE OUTLINED

Achievements, Future Tasks

Beijing HAIYANG KEXUE [JOURNAL OF MARINE SCIENCE] in Chinese No 3, 9 Jul 81 pp 1-3

[Article by Guo Fang [6751 2455], Environmental Science Committee, Chinese Academy of Sciences: "Energetically Develop Marine Environmental Science"]

[Text] The seas are one of the important areas of human activity, and marine science has already become one of the contemporary sciences. Our country has an extensive ocean area, and energetically expanding marine activities is extremely important in furthering the four modernizations. Since the state was founded, marine science in this country has made some strides. But marine environmental science got a rather late start. In the early 1970's, as a result of the grave lessons of environmental pollution abroad, this country began to turn its attention to environmental protection and opened up the field of environmental science. Since the first national environmental protection conference in 1973, much work has been done in marine pollution surveys and research into prevention and treatment, and considerable results have been obtained, filling in voids in our country's marine environmental science. Some of these results have played their requisite role in the drafting of this country's marine environmental protection policy and in controlling marine pollution and improving the quality of the marine environment.

1. Main Achievements

In marine pollution surveys and monitoring and in environmental quality research the Chinese Academy of Sciences, the State Oceanographic Office and the Ministry of Health, together with the coastal provinces and cities, have carried out joint surveys of offshore pollution and have accumulated valuable basic scientific data; the resultant understanding of offshore pollutant conditions has aided work aimed at protecting against and treating marine pollution. For example, a comprehensive survey of petroleum pollution sources and influencing factors in the southern Yellow Sea led to the conclusion that coastal oilfields and oil wastes discharged during transport were the main sources of oil pollution along the northern coast; this exploded the ideas that oil was issuing from the sea floor and that the oil was carried by ocean currents, and made the state resolve to take timely measures to guard against and treat pollution of the Bohai. In the past several years, comprehensive surveys of pollution of the Bohai, Dalian Bay and Qingdao and

Jiaozhou Bays, surveys of the mouth of the Yangtze and the nearby sea area, surveys of offshore pollution of the mouth of the Pearl River delta and the western Guangdong coast, and constant monitoring work gave us a fundamental understanding of the current scope and extent of our country's offshore oil pollution and accumulated large quantities of scientific data on pollutant sources and types of their quantities and distribution in sea water, the sea bottom and organisms. This has provided an excellent basis for a deepening of this country's marine environmental research. In the area of research methods and monitoring techniques, new technological trends are towards standardization and the use of aerial remote sensing.

In the area of protection against and treatment of marine pollution, the institution of management measures and the construction of control installations has led to a change for the better in the environmental quality of some of our offshore waters. For example, once the sources of petroleum pollution in the southern Yellow Sea were understood, management measures were intensified and treatment facilities for petroleum-containing wastewater were built, making it possible to control petroleum pollution in the Bohai. Equipment and techniques for dealing with marine oil pollution are also making progress.

In marine environmental science, research, we have already gradually proceeded from macroscopic studies of marine pollution sources, distribution and influencing factors to research on the fundamental laws of marine pollution. Investigations of the laws governing the migration and transformation of the main pollutants in the Bohai, Jiaozhou Bay and the mouth of the Yangtze River, investigations of the ecological principles of toxic effects on several economic organisms by pollution and studies of the ecological effects of pollutants have played a major role in regional marine environmental quality evaluation, the development of water quality standards, and environmental pollution control. Some progress has been made in toxicity research, investigation of marine pollution indicator organisms, study of the effects of pollution on aquatic resources, investigation of conversion mechanisms for certain heavy metals and of the effect of pollution on marine ecological systems, study of organic pollutants and red tides, and physical modeling of marine hydrologic diffusion. Studies of the relationship between marine pollutants and human health and epidemiological surveys have turned up some problems meriting attention.

2. Requirements Posed by the Four Modernizations and Construction

In spite of the results described above, we are still far below the advanced level abroad, and there are many gaps and weak links. Marine environmental science research abroad has progressed rapidly in recent years in response to the pressing requirements of economic development and environmental protection. Extensive use has been made of the achievements of modern science and technology, and especial attention has been given to intensified basic research. Much use has been made of combined on-the-spot surveys and laboratory research and of combined macroscopic and microscopic studies, and there has been extensive interpenetration and fusion of scientific disciplines, as well as international cooperation in large-scale investigations of regional and global pollution. Long-term comprehensive surveys of river mouths and bays have been made. Stress has been laid on studying the laws of pollutant migration, transformation and ultimate destination, and theoretical studies of pollutant interchange at interfaces and of the dynamic processes involved have been made, experimental techniques for controlled marine ecosystems have been developed, and particular attention has been paid to long-term studies and mathematical modeling of the effects of low-concentration pollutants on ecological systems. Ecological toxicity studies have reached the cellular molecular level. We must learn from advanced foreign science and technology, in keeping with our own country's situation, in order to better serve the four modernizations and construction.

At present, environmental pollution in this country is not yet under control, but is expanding somewhat from year to year. In the case of some pollutants such as SO_2, particulates and fluorine, the average load per unit area exceeds the worldwide average. The level of use of organochlorine pesticides is the highest in the world. Total wastewater discharge nationwide is also considerable, approaching 80 million tons a day. These contain harmful inorganic compounds such as suspended matter, salts, acids and alkalis; poisonous inorganic compounds such as heavy metals, cyanides and the like; organic oxygen-consuming substances such as nutrients with high N and P contents, BOD and COD components, and petroleum; and organic poisons such as phenol, agricultural pesticides, PCB's, polycyclic aromatics and the like. In addition, large quantities of idustrial waste are discharged every year; this wastewater, waste gas and solid waste ultimately will enter the seas directly or indirectly by various paths, and as the four modernizations and construction develop and the total output value of the national economy increases, the quantities may double by the end of the century. If we do not take steps to protect the environment, environmental pollution will increase severalfold. It has been reported that while the annual rate of increase in the output value of the Japanese economy is less than 6 percent, the level of pollution increases by 150-200 percent annually. This is a problem that must be given serious attention. If we carry out the four modernizations without controlling pollution, the pollution and a harm suffered by the seas will be incalculable.

This country has 18,000 kilometers of coastline and an extensive ocean area, rich resources, extensive shipping, and populous coastal cities with high concentrations of industrial and transport enterprises, and many good harbors and scenic areas. The coast is already suffering from various degrees of pollution, some bays and river mouths are rather heavily polluted, and instances of pollution have recently been numerous. As part of the four modernizations and construction, we must first develop energy resources, and energetically prospect for and develop petroleum resources on the continental shelf; we must develop coastal industry, and accordingly the numbers of such highly-polluting industrial enterprises as metallurgy, marine chemical engineering, petroleum refining and power production will be increasing; as marine transport develops, port facilities and marine engineering installations will be expanded and new ones built, all of which will directly influence the quality of the marine environment. Oil pollution merits particular attention. Energetic development of offshore oil is a universal trend. Internationally, the level of offshore petroleum output has already reached 32 percent, and 60 percent of petroleum is shipped by sea; every year 10,000 tons, or 0.5 percent, of petroleum escapes into the sea. In the future our country's offshore petroleum output will also be increasing, which poses a threat to the marine environment.

In order to raise the people's standard of living, this country's marine scientists are stressing energetic development of resources of marine organisms. It is estimated that if a modern marine farming area was built in our exclusive economic zone of about 2 billion mu, the annual output of aquatic products could be increased from somewhat over 3 million tons to more than 10 million tons, with great potential for further expansion. This requires that we continue to pursue research into marine environmental science, understand the characteristics of the environmental systems of this country's offshore area, monitor the offshore area and prevent it from becoming polluted, and give the organisms being raised a healthy environment for growth. The issue of how to develop the economy and carry out the four modernizations while at the same time protecting the marine environment is a new one which urgently requires marine environmental scientists' energetic efforts to solve it, because once pollution of the oceans takes place, it is not confined within national boundaries and recovery from it is difficult. Accordingly we must stress prevention, give priority to scientific research and accord the proper importance to the training of personnel, we must develop and strengthen the marine environmental science research contingent, continuously promote the cause of protecting the marine environment and adapt better to the requirements of the four modernizations and construction.

3. Future Research Tasks

To summarize the foregoing, this country's research tasks in marine environmental science are numerous and arduous ones. We must start by concentrating our forces on the main problems and investigate and solve the current problems of monitoring, control and treatment of marine pollution, while at the same time carrying out timely investigation and forecasting of the effects of the four modernizations and construction on the marine environment. We must pay particular attention to oil pollution, nitrogen, phosphorous, and organic pollutants and supernutrients, as well as agricultural pesticides and heavy metals, in an energetic effort to create the conditions for marine farming. This poses the following requirements:

1. After summing up past results, we must carry out thorough, comprehensive marine environmental surveys, monitoring and research in our country's sea area, and particularly the exclusive economic area, including the Bohai, the Yellow Sea, most of the East China Sea, the northern part of the South China Sea and the sea area off the archipelagos in the South China Sea. We must determine the nature of the pollution situation and achieve a complete understanding of this country's marine environmental quality. We must steadily expand deep-water pollution surveys and research.

2. We must intensify our study of the basic laws governing marine pollution and ecological effects. In the near term, we should make use of data from on-the-spot surveys, together with certain experimental results, to study the pathways by which certain major pollutants enter the sea, the quantities involved and their distribution in the environment, develop flowcharts and conceptual models, and identify possible paths of migration of different pollutants in order to further develop research into exchange of pollutants at the ocean-atmosphere, ocean-fresh water and ocean-bottom interfaces and the dynamic processes involved; we must pursue research into the effects of the main pollutants on ecosystems and particularly the laws governing the accumulation, migration and metabolism of pollutants in the food chain and the ecological network, as well as investigations of the long-term

effects of low-concentration pollutants on the structure and capabilities of the marine ecological system and mathematical models of these effects; and we must conduct simulation studies on wastewater dilution and diffusion in the environmental conditions of different sea areas.

3. We must strengthen our research into new methods and techniques in marine environmental science, such as the use of aerial and satellite remote sensing, computers and isotope techniques in marine pollution studies, the creation of hydrological-physical pollution modeling and ecological modeling laboratories and facilities for on-the-spot studies of pollution in controlled marine ecological systems, and research dealing with oceanic monitoring, analytical tests and technical facilities.

4. We must pursue research on the capacity of the marine environment, natural purification capabilities, methods of comprehensive marine environmental quality evaluation and comprehensive prevention techniques.

5. We must conduct energetic surveys and research on the effects of marine pollution on aquatic products and human health in order to provide scientific data for the development of marine water quality standards and fishery standards.

6. We must conduct research on the contributions of human activity and large-scale engineering to marine pollution and on ways of preventing or dealing with it.

7. We must work on marine environmental management and the development of policies and regulations.

Marine science and environmental science are both highly multidisciplinary "major sciences" which cover extensive areas and have voluminous content. Marine environmental science is an interface science resulting from the interpenetration of these two major sciences. As part of the implementation of the historical task of the four modernizations, our country's marine environmental science must absorb all relevant knowledge and achievements from relevant and helpful scientific disciplines and must interpenetrate and fuse with them, continually develop and improve, gradually set up a complete marine environmental system, and make a contribution to protecting the marine environment and to comprehensively promoting environmental protection.

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UV Spectrophotometry in Oil Pollution Identification

Beijing HAIYANG KEXUE [JOURNAL OF MARINE SCIENCE] in Chinese No 3, 9 Jul 81 pp 17-19

[Article by Zheng Shunqin [6774 5293 3830] and Huang Huarui [780[illegible] 5478 384[illegible]], Marine Research Institute, Chinese Academy of Sciences: "The Use of Ultraviolet Absorption Spectrophotometry To Identify Sources of Oil Pollution in the Southern Yellow Sea"]

[Text] Through the action of sunlight, wind and waves, solution, evaporation, and chemical and biological degradation, the components of oil entering the marine environment by various routes are altered, making it difficult to identify environmental samples by conventional methods for determining their nature and components.

Accordingly, a suitable method for identifying the sources of oil pollution in the marine environment is urgently needed for the purpose of preventing and identifying oil pollution.

Recently, Adland et al. [1] used the gas-phase spectral signatures of normal saturated hydrocarbons and sulfur compounds in petroleum as indicators for distinguishing petroleum pollutant sources. Subsequently, Erdman [2] also proposed a carbon-number distribution curve for normal saturated hydrocarbons, to be used as an index in identifying petroleum pollution sources. Phillipi [3] has proposed using the ratio $(C_{27} + C_{22})/C_{28} + C_{29})$ as an index for identifying petroleum pollution sources. Our spectral analysis of marine floating oil indicates that these three indices are effective in identification of marine petroleum pollution sources and particularly in dealing with weathered crude oil [5, 6], but the pretreatment required in these methods is rather laborious.

Levy [4] investigated the use of UV absorption spectrophotometry to determine petroleum products in the marine environment and suggested that the ratio of absorption at 228 and 256 nm be used as an index for identifying similar and dissimilar types of petroleum; he concluded that the method was sensitive and reliable, and used it to determine the sources of oil in the marine environment off eastern Canada.

We have also used UV spectrophotometry, taking the UV absorption curve and the ratio of absorption at 228 and 256 nm as the indices for distinguishing marine environmental and shore pollution sources. We carried out determinations of samples of oil immersed in the marine environment, floating oil taken from the survey area, shoreline pollution and samples from oilfields in suspected pollution-source areas, which allowed effective identification of petroleum pollution sources in the northern part of the southern Yellow Sea.

1. Experimental Method

Specimens D_1, D_2, D_3 and D_4 were oilfield samples from the suspected pollution-source area; specimens B , B_4, B_5, B_7, P_2 and P_3 were floating oil samples taken from the survey area, and specimens B_6, B_{10}, F_6, F_7 and F_{13} were samples of shoreline pollution.

Specimens D_3 and D_4 of oil immersed in water were stored on wooden frames fastened to a floating rack, so that the dispersed oil could be acted upon by the natural environment; it was left in the water for 4 months and a sample was taken each month.

Reagents: normal hexane, imported, various packaging.

Apparatus: Daojin QY-50 spectrophotometer, hydrogen lamp, 1 cm quartz colorimeter cuvette.

Specimen preparation and determination: A weighed aliquot of about 10 mg of the oil samples was taken and dissolved in normal hexane, then filtered through Whatman No 42 paper to remove insolubles, after which the filtrate was diluted with normal hexane to 100 ml and the absorption at 256 nm determine. Next the filtrate concentration was adjusted so that the absorption value at 256 nm was between 0.4 and 0.8, after which the absorption values of the liquid were determined between 210 and 350 nm and the absorption ratio for 228 and 256 nm was determined.

2. Results and Discussion

Determinations made of the UV absorption spectra of suspected pollution-source area samples D_1, D_2, D_3 and D_4 and Iraqi and Algerian oil samples are shown in Figs 1 and 2.

The UV absorption curves for D_1, D_2, D_3 and D_4 each show a maximum absorption peak at 228 nm with a rather weak absorption peak at 256 nm. The Iraqi and Algerian oil samples also show peaks of 228 and 256 nm. The spectra also show that the differences in absorption at 228 nm are greater than those at 256 nm. As Table 1 indicates, the absorption ratios for these two wavelengths range from a maximum of 2.93 for the Algerian oil, down through the values for D_2, D_1, D_3 and D_4, to a minimum of 1.43 for the Iraqi oil. Fig 1 shows the similarity between the absorption curves for D_1 and D_2, which have rather similar ratios for the two peaks, equal to 2.18 and 2.38 respectively. The curves for samples D_3 and D_4 are even closer; both have ratios of 1.85, demonstrating that D_3 and D_4 were the same type of crude.

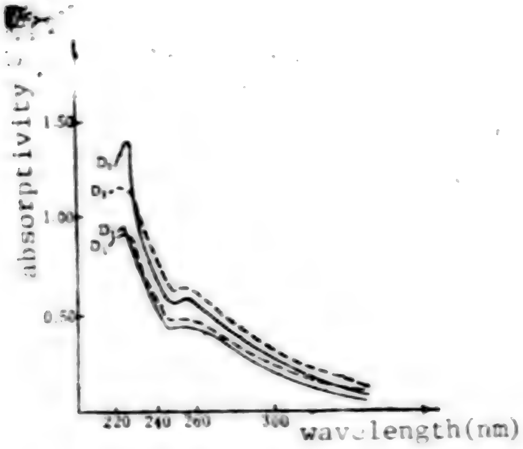

Fig 1. UV spectra for suspected pollution-source oilfields.

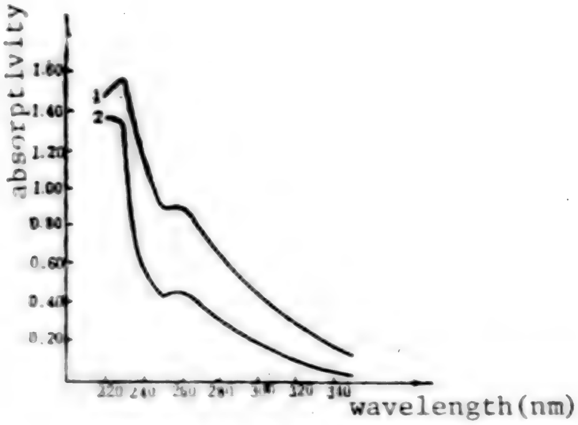

Fig 2. UV spectra of foreign oils.

Key: 1. Iraqi 2. Algerian

Table 1. UV absorption characteristics for crude oil samples

a) 样 品	b) 吸 收 值		d) 比 值
	c) 228 毫微米	c) 256 毫微米	(A_{228}/A_{256})
D_1	0.96	0.44	2.18
D_2	1.38	0.58	2.38
D_3	1.15	0.62	1.85
D_4	1.85	1.00	1.85
e) 伊拉克油	1.55	0.86	1.43
f) 阿尔及利亚油	1.37	0.46	2.98

Key:
- a. Sample
- b. Absorption values
- c. Nanometers
- d. Ratio
- e. Iraqi crude
- f. Algerian crude

The UV absorption curve for sample D_3 after 4 months immersion in sea water indicated that other than differences resulting from a different concentration in the control sample, the curves were almost identical (see Fig 3). It can be seen from Table 2 that the ratio of absorption at 228 and 256 nm shows no changes, except that the D_3 sample dispersed for 1 month showed rather low results, possibly resulting from contamination; this proves that the environment produced no major changes in the relative concentrations of the compounds with these absorption characteristics. Accordingly, the absorption ratio can be used as a convenient and correct method of distinguishing oil samples.

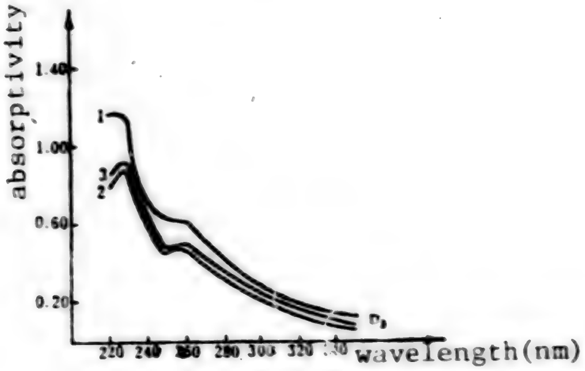

Fig 3. UV absorption spectra of immersed oil samples.

Key:
1. Control
2. Immersed 2 months
3. Immersed 4 months

Table 2. UV absorption characteristics for crude oil samples immersed in water (ratio of A_{228}/A_{256}).

a) 样品 / b) 浸泡时间	D_3	D_4
c) 原 始	1.85	1.85
d) 一 个 月	1.61	1.80
e) 二 个 月	1.87	1.83
f) 三 个 月	1.85	1.83
g) 四 个 月	1.84	1.84

Key:
- a. Specimen
- b. Duration of immersion
- c. Initial
- d. 1 month
- e. 2 months
- f. 3 months
- g. 4 months

The UV spectra of Fig 4 indicate that floating oil specimen B_5 and shoreline pollution sample F_6 resemble sample D_1 from a suspected pollution source area, since they all show a strong absorption peak at 228 nm and a weak absorption peak at 256 nm and have absorption peak ratios of 2.12, 2.11 and 2.18 respectively. Fig 5 shows that floating oil sample P_3 and shoreline pollution sample B_6 have spectra similar to that of suspected pollution source oil sample D_3, with absorption peaks at 228 and 256 nm and absorption ratios of 1.73, 1.85 and 1.85 respectively.

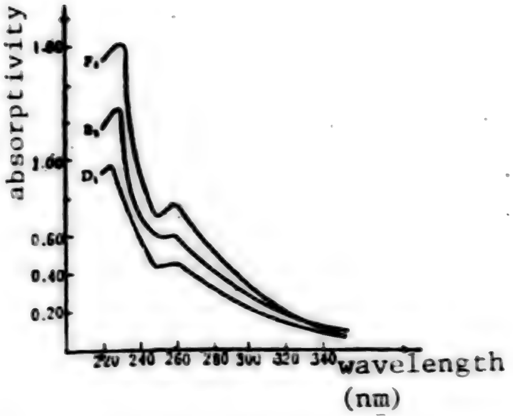

Fig 4. UV absorption spectra of floating oil sample B_5 and shoreline sample F_6.

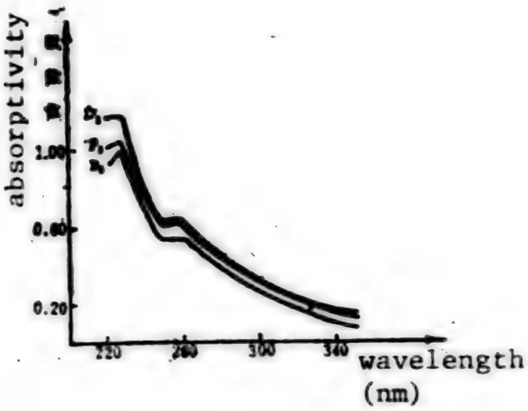

Fig 5. UV absorption spectra of floating sample P_3 and shoreline sample B_6.

Comparing the absorption characteristic A_{228}/A_{256} for floating oil samples, shoreline samples and suspected pollution source samples (Tables 1, 3 and 4), we discovered that floating oil samples B_2, B_4, B_5 and P_2 and shoreline sample F_6 are identical with suspected pollution source sample D_1, that floating oil sample B_7 and P_3 and shoreline samples B_{10} and F_{13} are identical with suspected pollution source D_3, and that shoreline sample F_2 is identical with suspected pollution source sample D_2.

Table 3. UV absorption characteristics of floating oil samples from survey area.

a) 样 品	b) 吸 收 值		d)比 值
	228 c)毫微米	c) 256 毫微米	(A_{228}/A_{256})
B_2	1.25	0.60	2.08
B_4	0.93	0.44	2.11
B_5	1.25	0.59	2.12
B_7	1.70	0.95	1.79
P_2	1.15	0.54	2.13
P_3	1.04	0.60	1.73

Key:
a. Specimen
b. Absorption values
c. 228 nm
d. 256 nm
e. Ratio

Table 4. UV absorption characteristics of shoreline samples

a) 样 品	b) 吸 收 值		d) 比 值
	c) 228 毫微米	c) 256 毫微米	(A_{228}/A_{256})
B_6	0.98	0.53	1.85
B_{10}	0.84	0.47	1.79
F_6	1.60	0.76	2.11
F_7	1.29	0.54	2.39
F_{13}	1.35	0.75	1.80

Key:
a. Specimen
b. Absorption values
c. 228 nm
d. 256 nm
e. Ratio

We conclude from comparison of the absorption characteristics given above that oil samples B_2, B_4, B_5 and P_2 from the survey area entered the sea from oilfield D_1 or in transport of D_1 oil, and that samples B_7 and P_3 came from oilfield D_3 crude or from transport of D_3 crude. Shoreline samples B_6, B_{10} and F_{13} came from oilfield D_3; F_6 came from D_1, F_7 came from D_2 (or from transport of oil from these fields). This conclusion agrees with the results of gas phase spectral analysis, pulin [086E-5123] analysis, sulfur percentage determination and the analysis of hydrologic and meteorological data for the survey area [7].

The results also show that UV absorption spectrometry using the absorption ratio for 228 and 256 nm is a suitable indicator of the origin of marine petroleum pollution. The method has the advantages of simplicity, small sample requirements, and rather stable results.

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Determination of Zinc in Seafood

Beijing HAIYANG KEXUE [JOURNAL OF MARINE SCIENCE] in Chinese No 4, Oct 81 pp 24-27

[Article by Yin Yi [1438 3015] of the First Oceanography Institute of the National Bureau of Oceanography, Wen Congjiang [3306 1783 3068] of the Qingdao City Health and Epidemic Prevention Station: "Measurement of ^{65}Zn in Seafood*"]

This article was the special topic report presented in October, 1979, at the National Academic Conference on the Survey of Radioactivity in Seafoods. Comrades Song Shaoyi [1345 4801 5030] and Ha Jilu [0761 4949 6922] provided guidance and help in this work, for which appreciation is expressed.

[Text] The major source of ^{65}Zn in the ocean is the atomic energy industry along the coast, nuclear powered ships and thermonuclear weapons tests. Zinc is a component of several important enzymes in living organisms. It exists commonly in the bodies of oceanic creatures. Because the intake of ^{65}Zn is large and because its half life is relatively long, living beings have a strong ability to absorb it and condense it. Therefore, the content of ^{65}Zn in seafood is more or less directly related to the protection of the oceanic environment and the physical health of the people. The following is an introduction to the measurement of ^{65}Zn in seafood of the coastal seas of our nation.

Method of Measurement and Instruments

I. Method

^{65}Zn decays to ^{65}Cu via two ways, electron capture and $\beta+$ decay. During the course of decay, it produces a γ ray (intensity of 51 percent) of an energy of 1.12 MeV and a β ray (intensity of 1.54 percent)[1] of an energy of 0.324 MeV. It also produces a characteristic X ray of an energy of 8.0 KeV. The measurement of ^{65}Zn in seafood is a low level radioactive measurement relying on the superiority factor $\omega(\rho \approx \eta^2 /B)$ as the major technical index to select the method of measurement. For this, we have selected the NaI (TI) γ spectrograph of a reverse fitted mask of low background to measure the 1.12 MeV γ ray of ^{65}Zn, thus achieving the goal of measuring ^{65}Zn in seafood.

II. Instruments

The main detector[2] of the NaI (TI) γ spectrograph of a reverse fitted mask of low background has a columnar NaI (TI) crystal of a diameter of 80 millimeters and a thickness of 80 millimeters with a pure NaI (TI) light guide of a diameter of 80 millimeters and a thickness of 80 millimeters. A photoelectric multiplier tube is used to gather light signals. The reverse fitted ring detector is formed by superimposing three NaI (TI) crystals each with an outer diameter of 200 millimeters, an inner diameter of 100 millimeters and a thickness of 100 millimeters. Eight photoelectric multiplier tubes on top gather light signals. The main detector is placed inside the central passageway of the ring detector. The entire probe is placed inside a cylindrical shield with a steel wall 145 millimeters thick, a lead wall 25 millimeters thick, a stainless steel wall 5 millimeters thick and an organic glass wall 5 millimeters thick. A 512-channel pulse amplitude analyzer is used for spectrographic measurements.

When the surface of the main detector is at the central position of the ring detector, the efficiency of detection of η by the spectrograph using the ^{65}Zn standard face as the source at the center of the surface of the main detector is 2.3 percent. The corresponding integrated background is 1.66 cpm, and the energy resolution is 12.2 percent. If the sample and the background measuring times are both taken to be 400 minutes, then, when the reliability is 95 percent, the lower limit of detection of the advice is 0.28 cpm.

III. Analysis of the γ Spectrum

Qualitative and quantitative analysis of the γ energy spectrum is an important step in determining the type of nuclear elements and the intensity in the sample measured. The analysis of the γ spectrum is complex, generally it is calculated by computer. Because this experiment measures only the γ ray of a single energy level of a known element ^{65}Zn, the spectrogram is simple and analysis of the γ spectrum can be performed using a minicomputer.

1. Determination of the parameters of the full energy peak: LnQ diagrammatic method[3]. The actually measured γ spectrum of the standard source of ^{65}Zn approximates and obeys the normal distribution in statistics. Therefore, the analysis of the γ spectrum can be carried out using the characteristics of the normal distribution in statistics. The probability density function of the normal distribution is:

$$y(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{1}{2}\left(\frac{x-x_0}{\sigma}\right)^2} \qquad (1)$$

Let Q(x) be a function and let

$$Q(x)=\frac{y(x-1)}{y(x+1)} \qquad (2)$$

Substituting equation (1) into equation (2) we have:

$$Q(x)=\exp\left[\frac{2(x-x_0)}{\sigma^2}\right] \qquad (3)$$

Take the natural logarithm on both sides of equation (3) to obtain the linear equation:

$$\ln Q(x)=\frac{2}{\sigma^2}x-\frac{2}{\sigma^2}x_0 \qquad (4)$$

Using actually measured data and equation (4) to plot a graph, we can obtain the straight line relationship between lnQ(x) and x. The value of x ($x = x_0$) corresponding to lnQ(x)=0 is the peak of the full energy peak. From the slope of the straight line we can obtain the width parameter σ of the full energy peak.

From the normal distribution characteristic we can calculate the half width parameter of the full energy peak as B = 2.355σ, and further obtain the energy resolution F. The experiment found: x_0 = 228 lines; σ = 11.8 lines; B = 27.8 lines; F = 12.2 percent.

2. Determination of the area of the peak: Let A be the area of the peak, x_0 ±n be the border lines in the peak area, Y_{Si} be the total count of the ith line of the sample source, Y_{Bi} be the count of the ith line of the blank source of the reagent, then:

$$A=\sum_{i=x_0-n}^{x_0+n}(Y_{Si}-Y_{Bi}) \qquad (5)$$

Only when the selection of the area of integration of the lines (W = 2n + 1) is appropriate can the best result be obtained for A. If W is too small, A will be too small because of the effects of resolution. If W is too large, the error introduced by statistical extremes will be larger. The selection of the best value of W is still based on the principle of taking the maximum superiority factor Q. Let the area of the full energy peak of the 1.12 MeV γ ray of the normalized ^{65}Zn be 1, then we know from the standard normal distribution that the integration of function f(x) over ±kσ, i.e., its probability is:

$$f(x)=\frac{2}{\sqrt{2\pi}}\int_{0}^{k} e^{-\frac{x^2}{2}}\,dx \qquad (6)$$

The relationship between f(x) and k can be looked up in the frequently used tables of mathematical statistics. The efficiency of detection of η in the area between the lines x_0 ±n (n = kσ) is proportional to f(x). Therefore, by plotting $f^2(x)/B$ - ±kσ, we can obtain the relationship curve between the superiority factor Q and ±kσ, as shown in Figure 1. The value of k where η^2/B is the largest is the parameter of the best integration area W we are seeking. We have obtained from the experiment that when k = ±1.7, the lines 208 to 248 are the lines in the best integration area.

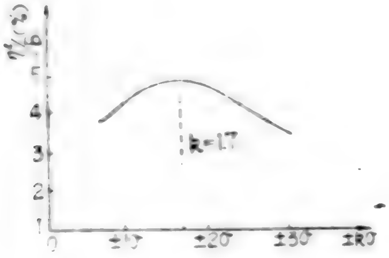

Figure 1 Relationship curve between η^2/B and ±kσ

Results of Measurements

The computational formula for calculating the content of Z in ^{65}Zn in seafood is:

$$Z=\frac{I\times M_1}{2.22\times \eta\times Y\times M_2\times e^{-\lambda t}}\ (\mathrm{pCi/kg}) \qquad (7)$$

In the equation: I is the net count of the sample measured (cpm); M_1 is the ash and fresh sample ratio in the sample measured (g/kg); M_2 is the amount of ash in the sample measured (g); η is the counting efficiency of the instrument (%); Y is the chemical retrieval rate (percent); $e^{-\lambda t}$ is the correction factor of the decay from the time of gathering the sample to the time of measurement.

We used the above method to measure ^{65}Zn in 41 types of seafood in the coastal seas of our nation. The results of the measurements are listed in the accompanying table. Figure 2 is the actually measured γ spectrum of ^{65}Zn in the Qingdao clam. Line 228 corresponds to the full energy peak of the 1.12 MeV γ ray of ^{65}Zn. Line 304 corresponds to the full energy peak of the 1.46 MeV γ ray of ^{40}K. The source of ^{40}K in the background is the NaI (TI) crystal and the photoelectric multiplier tube. The ^{40}K in the sample comes from traces of ^{40}K contamination due to electrical sedimentation during the course of preparing the sample.

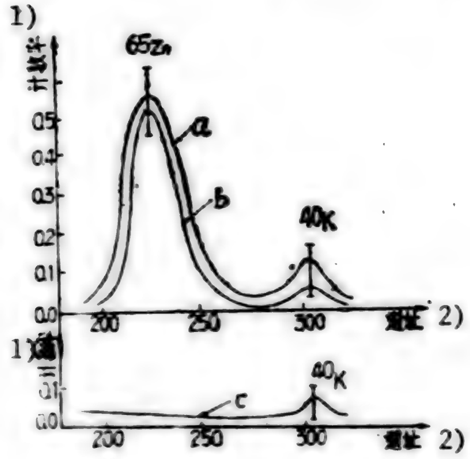

Figure 2 The measured spectrum of ^{65}Zn in the Qingdao clam. a. Full spectrum of the sample; b. Sample spectrum; c. Background spectrum; 1. Count; 2. Line location.

Accompanying Table Content of ^{65}Zn in the seafood of the coastal regions of our nation, 1977-1979

A 样品名称	采样日期 B（年月）	测量日期 C（年月）	化学回收率 D（%）	本底计数率 E（cpm）	样品净计数率 F（cpm）	^{65}Zn含量 G（pCi/kg）
1 渤海中国对虾	1977.10	1978.12	87.1	1.66	0.72	5.2±0.8
2 渤海大连湾牡蛎	1977.11	1978.12	82.2	1.66	0.12	未检出 I
3 渤海海带	1977.8	1978.11	89.0	1.66	0.59	14.1±2.2
4 渤海兰点无鳔鲅	1977.8	1978.11	94.4	1.66	0.70	6.1±0.7
5 渤海杂色蛤	1977.11	1978.12	99.1	1.66	0.10	未检出
6 渤海日本枪乌贼	1977.12	1979.4	99.6	2.01	0.22	未检出
7 渤海毛蚶	1977.10	1978.12	63.8	1.66	0.60	13.6±1.6
8 渤海比目鱼	1977.10	1978.11	61.6	1.66	0.94	7.7±1.1
9 黄海海带	1977.5	1978.12	89.7	1.66	0.17	未检出
10 黄海裙带菜	1977.4	1978.12	63.0	1.66	0.38	11.0±2.3
11 黄海乌贼	1977.10	1978.11	89.1	1.66	1.00	6.1±0.7
12 黄海紫贻贝	1977.8	1978.12	89.0	1.66	0.58	10.8±1.9
13 青岛杂色蛤仔	1978.4	1978.12	73.7	1.66	10.46	108.4±1.9
14 黄海中国对虾	1977.10	1979.4	85.7	2.01	0.21	未检出
15 黄海鹰爪虾	1977.4	1978.12	76.7	1.66	0.53	7.4±1.4
16 黄海牙片	1977.4	1978.12	98.1	1.66	1.64	16.7±1.3
17 黄海大黄鱼	1978.4	1979.4	92.1	2.01	0.04	未检出
18 黄海短蛸	1978.6	1978.12	94.1	1.66	0.16	未检出
19 黄海日本枪乌贼	1977.11	1978.12	100.0	1.66	1.57	13.7±1.1
20 黄海中国毛虾	1978.10	1979.4	94.6	2.01	0.02	未检出
21 黄海带鱼	1977.6	1979.4	94.6	2.01	0.03	未检出
22 黄海兰点无鳔鲅	1977.5	1979.4	99.6	2.01	0.06	未检出
23 东海中国对虾	1977.8	1979.4	81.4	2.01	0.08	未检出
24 东海乌贼	1977.9	1979.4	88.7	2.01	0.04	未检出
25 东海鳗鱼	1977.9	1978.12	93.4	1.66	0.27	未检出
26 东海大黄鱼	1977.9	1978.12	缺 H	1.66	0.06	未检出
27 东海鲐鱼	1977.9	1979.4	81.4	2.01	0.00	未检出
28 东海肠浒苔	1978.1	1978.11	79.2	1.66	0.31	3.2±0.9
29 东海马面鱼	1978.1	1978.12	96.4	1.66	0.22	未检出
30 东海半滑舌鳎	1977.9	1979.4	89.0	2.01	0.21	未检出
31 东海坛紫菜	1977.11	1979.4	82.8	2.01	0.14	未检出
32 东海杂色蛤	1977.8	1979.4	75.1	2.01	0.25	未检出
33 东海缢蛏	1977.8	1979.4	98.9	2.01	0.13	未检出
34 东海海带	1978.5	1978.12	87.1	1.66	0.16	未检出
35 东海带鱼	1977.10	1979.4	86.0	2.01	0.16	未检出
36 东海兰点无鳔鲅	1978.10	1979.4	94.3	2.01	0.19	未检出
37 东海鳗鱼	1978.10	1979.4	81.0	2.01	0.13	未检出
38 南海红笛鲷	1978.1	1978.11	84.6	1.66	0.24	未检出
39 南海小其林菜	1977.9	1978.11	93.3	1.66	0.59	13.0±1.8
40 南海灰星鲨	1977.10	1979.4	78.6	2.01	0.09	未检出
41 南海带鱼	1978.4	1979.4	98.0	2.01	0.16	未检出

J 注1：四个平行样叠加作一次测量，化学回收率为四个平行样的平均值。

K 注2：样品分两批测定，两次本底计数率及探测下限存在一定的差别。

[Key on following page]

Key to table on p 73:

A. Name of sample
B. Date sample taken (year, month)
C. Date of measurement (year, month)
D. Chemical retrieval rate (percent)
E. Background count (cpm)
F. Net count of sample (cpm)
G. Content of ^{65}Zn (pCi/kg)
H. Lacking
I. Not detected
J. Footnote 1: Four parallel superimposed samples were measures at once, the chemical retireval rate was the average of the four parallel samples.
K. Footnote 2: The samples were measured in two groups, a fixed difference between the two background counts and the lower limit of detection was present.

1. Chinese prawns of Bohai
2. Oysters of Dalian Bay in Bohai
3. Bohai kelp
4. Bohai blue spotted air bladderless mackerel
5. Bohai mixed color clam
6. Bohai Japanese cuttlefish
7. Bohai blood clam
8. Bohai flounder
9. Huanghai kelp
10. Huanghai seaweed
11. Huanghai cuttlefish
12. Huanghai purple mussle
13. Qingdao mixed color clam
14. Huanghai Chinese prawns
15. Huanghai claw shrimp
16. Huanghai chiton
17. Huanghai yellow croaker
18. Huanghai mantis
19. Huanghai Japanese cuttlefish
20. Huanghai Chinese shrimp
21. Huanghai hairtail
22. Huanghai blue spotted air bladderless mackerel
23. Donghai Chinese prawns
24. Donghai cuttlefish
25. Donghai Chinese herring
26. Donghai yellow croaker
27. Donghai butterfish
28. Donghai liver mosses
29. Donghai black scraper
30. Donghai tonguefish
31. Donghai laver
32. Donghai mixed color clam
33. Donghai razor clam
34. Donghai kelp
35. Donghai hairtail
36. Donghai blue spotted air bladderless mackerel
37. Donghai Chinese herring
38. Nanhai porgy
39. Nanhai eucheuma edule
40. Nanhai gray shark
41. Nanhai hairtail

Discussion

1. This is the first measurement of ^{65}Zn in seafood of the coastal seas of our nation. Among the 41 seafoods measured, ^{65}Zn was not detected in about two thirds of the samples (lower than the smallest amount measurable by the instruments). The detected amount of ^{65}Zn in the samples examined was between 3 pCi/kg and 17 pCi/kg, showing that pollution of our nation's coastal seas by ^{65}Zn is not widespread and not serious.

2. The samples with ^{65}Zn detected were mostly from Bohai and Huanghai. This shows the content of ^{65}Zn in our nation's northern seas is higher than the southern seas. This basically coincides with the actual utilization of nuclear energy in our nation.

3. The content of ^{65}Zn in the edible part of fish is lower than the content of ^{65}Zn in the edible parts of crustaceans, algae and molluscs while the content of ^{65}Zn in crustaceans and algae is relatively high. Therefore, in monitoring ^{65}Zn pollution of the ocean we can use crustaceans or algae as the indicator lifeforms.

4. The content of ^{65}Zn in a few samples was relatively high. The content of ^{65}Zn in the Qingdao mixed color clam was the highest, reaching 1.1×10^2 pCi/kg. The contents of ^{137}C and ^{55}Fe in that sample were also far higher than in other seafoods. This may be due to the presence of the polluting source near Qingdao. This problem requires further study.

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9296
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Dalian Meeting Studies Pollution Threat

Beijing XINHUA in English 1250 GMT 27 Nov 81

[Text] Dalian, 27 Nov (XINHUA)--Chinese marine environment experts call for serious attention to possible marine pollution from increasing offshore oil prospecting and exploitation in the coastal waters. They urged that efforts be made to find counter-measures to minimize the danger.

This was a major theme of a recent symposium on marine environment science held in the port city of Dalian, northeast China. Attending were 140 experts, professors and marine researchers from scientific institutions, colleges, sanitation organizations and naval units as well as related departments of the coastal provinces and municipalities.

Experts assessed the quality of marine environment in China's seas and comprehensive measures to survey, monitor and control pollution.

Petroleum, according to Shi Erhou, deputy head of the Bohai monitoring station under the State Ocean Bureau, was the most principal pollutant. Some parts of Bohai Bay and the East China Sea were already rather seriously contaminated. The situation could be reversed, he said.

China started its study of marine pollution in 1972. Surveys of 380,000 square kilometers of marine areas have been made.

Bohai Bay has a priority rating in marine environment protection, being an inland sea with a low self-purification capacity and surrounded by heavy industrial centers and oil fields. Along the southern bank of Bohai is the Shengli oil field, the second largest oil producer in China. It now has 16 facilities for treating polluted water and 94 percent of the effluent is caught. In the past three years, the Qilu oil refinery in Shandong Province has recycled 50,000 tons of crude oil from its two waste water treatment installations.

Addressing the symposijm, Luo Yuru, president of the Council of the Chinese Ocean Environment Science Society and deputy director of the State Oceanic Bureau, underlined the importance of protecting the China seas from contamination to protect China's environment as a whole.

He also urged cooperation with foreign counterparts since the seas of the whole globe were connected and marine pollution was a common problem.

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TITLE: "Marine Geochemistry of Nitrogen Near the Estuary of the Changjiang River. I. Nitrate in Sea Water Near Estuary"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 11 No 4, 1981 pp 37-46

TEXT OF ENGLISH ABSTRACT: Marine geochemistry of nitrogen near the estuary of the Changjiang River was investigated during five cruises between August and December, 1963. NO_3-N, NO_2-N, NH_4-N and organic-N were measured. High concentrations of NO_3-N, 150-220 mg/m^3, are in estuarine and coastal waters, and low concentrations, 0.5 mg/m^3, are in offshore waters. It clearly shows that the high concentrations of NO_3-N is from the Changjiang River water which takes NO_3-N, etc., from the nitrogen cycle along the river and partly from chemical fertilizer. The vertical profile distribution of NO_3-N shows that it coincides with the σ_t. In summer, the low concentration of NO_3-N in the upper layer is due to consumption by photoplankton, and the high concentration below the thermocline is from regeneration from dead organisms. The monthly variation of NO_3-N shows that most of it

[Continuation of SHANDONG HAIYANG XUEYUAN XUEBAO Vol 11 No 4, 1981 pp 37-46]

in the middle and upper layers is low in summer-autumn due to consumption and high in autumn-winter, supplied by water vertical mixing. The high atomic ratio of NO_3-N/PO_4-P in the estuary and low ratio in offshore water show the large influence of river water. High concentration of NH_4-N shows that the $NH_4^+ = NO_2^- = NO_3^-$ system is in a thermodynamic nonequilibrium state. However, the total inorganic nitrogen in the estuarine area is high, and this is the chemical nutrient base of the famous fishing ground. In June 1980, a very high concentration of NO_3-N, 910 mg/m^3, was found in estuarine water (J. Edmond), which is four times higher than that in 1963. This increased NO_3-N is mainly from chemical fertilizer, which coincides with the increase in the number of fertilizer plants along the river, and with the decrease in number of the green frog, field snail, snake, etc., in rice water fields.

9717
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NOISE, ELECTROMAGNETIC POLLUTION STUDIED

Noise Pollution Worsening

Beijing GUANGMING RIBAO in Chinese 25 Sep 81 p 3

[Article by Fang Danqun [2455 0030 5028] and Feng Genquan [1409 2704 3123]: "Physical Pollution and Its Control"]

[Text] In addition to chemical pollution of the water, air, and soil environment, another important class of public hazard that is becoming increasingly more serious in recent years is the physical pollution of noise, vibration, electromagnetic radiation, light, and heat.

Among the various physical pollutants, noise stands at the top of the list. In some industrially developed nations, since other pollutants have gradually been placed under control, noise pollution, which used to be the third [worst] public hazard, has now become public hazard number one. Of all the public hazard court cases in Japan, the number of noise pollution cases has been the highest in years. In Beijing, the number of suits related to noise is 41 percent of all pollution-type [suits]; in Shanghai, the figure is 50 percent. A number of clashes between residents and plants have taken place in various places due to noise disturbances.

The seriousness of noise pollution has caused worldwide concern. It is predicted that by the end of this century many people will become deaf if proper measures are not taken. Research in recent years has revealed that noise not only can lead to deafness but also can cause high blood pressure, coronary heart disease, and neurosis. Noise can affect the signal-transmission function of the brain and the intellectual development of people, especially youths.

Electromagnetic radiation pollution is a new type of pollution that has come about in recent years. Electromagnetic radiation pollution can be caused by radio-transmission devices, various electrical appliances, and radiofrequency equipment. Electromagnetic pollution can cause workers and residents to suffer from the symptoms of headaches, dizziness, insomnia, frequent dreams, memory loss, palpitations, and psilosis. In serious cases, it can cause syncope or shock. Morever, it can also lead to loss of control of electronic equipment, prevent the reception of television and radio signals, and may even cause combustion and explosion of explosives, weapons, combustible gases, and oil storage tanks.

Thermal pollution is pollution in the making. When high-temperature industrial wastewater enters the water system, it can reduce the oxygen-dissolving ability of river water, thus killing fish and altering the aquatic ecology. When urban industrial heat enters the atmosphere, it raises the temperature of the urban area above that of the surrounding rural area and produces a "heat island" phenomenon. If proper preventive measures are not taken, it is estimated that the temperature in many cities will be substantially higher by the end of this century, and that this will constitute a serious problem for people living in such a high-temperature environment.

Faced with the increasingly serious physical pollution of the environment, the human race has mounted a struggle to counter it. Since the 1970's, a new scientific and technological field--environmental physics--has come into existence. This science studies the law of motion of physical pollutants such as noise, vibrations, and electromagnetic, light, and heat radiation in the human environment and investigates ways to control physical pollution of the environment.

To control noises and vibrations in the environment, people have developed such technologies as acoustic absorption, soundproofing, elimination of sound, vibration proofing and damping, personnel protection, and architectural layout. In acoustic absorption, absorbent materials are used to decorate the interior surfaces of rooms, and spatial acoustic absorbers can be suspended indoors. Mufflers are an important device for eliminating gas-flow noise. They are installed in airflow passages in aerodynamic machines in order to reduce noise and allow the gas to flow through unimpeded. Soundproofing means enclosing the noise-producing device, or the location where quiet is desired, in a confined space so as to isolate it from its surroundings. Vibration absorption requires the installation of vibration absorbers under the machinery so that vibrations will not spread to the surrounding environment. In the damping method, damping materials are put on the surface of the radiating body to increase the loss of vibration and sound energy and thereby achieve the goal of noise reduction. In personnel protection, earplugs, earmuffs, soundproof_cotton, vibration-proof boots, and vibration-proof pads are used to prevent persons from noise hazards. Noise reduction through architectural layout refers to the control of environmental noise by appropriate urban planning and sensible plant layouts. These seven major noise-control techniques have made rapid progress in recent years and are moving toward standardization and serialization of components and products. China now has more than 10 plants for the production of noise-control devices. With determination, many environmental noise problems can be solved.

The principal technical measure for controlling electromagnetic radiation pollution is to use an electromagnetic shield to keep the intensity of radiation within an allowable range. An active shield covers up the field source to control its pollution of the environment, while a passive shield covers the personnel or the equipment. Metallic conductors such as copper, aluminum, or iron can be used as shields against high-frequency radiation, while iron, copper, or other absorbent materials can be used against microwave radiation. Today, electromagnetic shields are being used as radiation protectors with considerable success, while shielded rooms have effectively solved some electromagnetic radiation pollution problems.

Overall, environmental physics and techniques to control physical pollution to the environment are in the development and formation stage. There is a great amount of work yet to be done.

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New Advances Using Computers

Beijing BEIJING RIBAO in Chinese 29 Sep 81 p 1

[Article: "Our Nation Makes New Discoveries in Noise Study, Utilizing Computers in Analysis Proves For the First Time That Noise Causes Damage to the Functions of the Brain and the Cardiovascular System"]

[Text] China has scored important research achievements in utilizing computers to analyze the electrocardiographic and electroencephalographic effects of noise upon the human body. This research has proved for the first time the damage to the functions of the human brain and the cardiovascular system caused by noise. It has provided a scientific method to establish noise standards and it has also provided a more scientific and effective indicator and an important means for the early diagnosis and emergency treatment of diseases of the cardio-cerebral system.

For a long period, in foreign and domestic research in the effects of noise upon the human body, little in-depth research has been done on the effect of noise upon the brain and the cardiovascular system. Therefore, in establishing standards for industrial noise, efforts started out only from protecting hearing. Mostly middle-aged and younger scientific and technical personnel of the 8 units of the Beijing Municipal Labor Protection Science Institute, the Chinese Environmental Sciences Academy, the Beijing Municipal Emergency Medical Research Laboratory utilized computers to analyze the electrocardiographic and electroencephalographic effects of noise. Their efforts are creative in theory and in method.

This research began in 1979. Assistant researcher Feng Genquan [1409 2704 3123] of the Chinese Environmental Sciences Academy, assistant researcher Fang Danqun [2455 2588 5028] of the Beijing Municipal Labor Protection Science Institute cooperated with related units to conduct research in the effect of noise upon the human body in their research task to complete the formulation of "Public Health Standards For Noise in Designing Industries and Enterprises." They utilized computers to analyze electroencephalograms and discovered that the indicators obtained reflected certain effects of different intensities of noise upon the functions of the brain of workers, while the electroencephalograms of these workers did not show anything wrong when analyzed by the common observational methods frequently used clinically. The result of this research was presented to the 10th International Acoustics Conference, and it attracted the attention of foreign scientists and it also attracted the interest of medical workers at home and abroad. Li Zonghao [2621 1350 3185], the physician in charge at the Beijing Municipal Emergency Medical Research laboratory, et al., believe the indicators obtained by the research described above can hopefully become effective indicators for clinical diagnosis of diseases of the cardio-cerebral system.

On 27 September, the Beijing municipal science committee organized concerned departments to evaluate this achievement and, at the same time, exchanged opinions concerning clinical applications and its application in emergency treatment. Specialists believe this research achievement is a new discovery in the realm of noise studies and is up to international standards.

9296
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BRIEFS

NEI MONGGOL ENVIRONMENT--The Baotou Municipal Institute of Environmental Protection, for the first time successfully used a foreign method called lime filter paper [shi hui lu zhi fa] to determine the concentration of fluorine within a 65-kilometer radius. The institute disclosed that the main pollutant in Baotou Municipality is industrial discharge. [SK090844 Hohhot Nei Monggol Regional Service in Mandarin 1100 GMT 6 Jan 82 SK]

ANSHAN COMPLEX--Beijing, January 16 (XINHUA)--The plan of the Anshan Iron and Steel Complex, China's biggest, to bring pollution control in the five years between 1981 and 1985 is on schedule, according to an announcement at a meeting called by the State Capital Construction Commission this week. The complex has since 1978 instituted 58 projects which treat 2.22 million cubic meters of waste gas and 4,890 tons of waste water per hour and 2.05 million tons of slag a year. The average annual coal saving realized through this is 40,000 tons. The complex retrieves 140,000 tons of iron dust, 1,200 tons of sulphuric acid, 2,000 tons of coke powder, and 17.89 million tons of water and 85,000 tons of steel, worth 40.7 million yuan (rmb). An additional 130 million yuan of investment will be needed to achieve the pollution control goal set for 1985. Part will be covered by the savings in coal and recycled materials which amounts to 14.33 million yuan a year. The Anshan Iron and Steel Complex, which was established in 1917 and renovated in the 1950's with Soviet technology, is again undergoing technical transformation for higher output and better management. Part of the money earmarked for renovation will go for pollution control. [Text] [OW161237 Beijing XINHUA in English 1213 GMT 16 Jan 82]

ENVIRONMENTAL ENGINEERING SOCIETY--Wuhan, 12 Nov (XINHUA)--The China Society for the Study of Environmental and Hydraulic Engineering was established here recently. The new society is to assay the effects, prevention and control of water pollution and to study the influence on the environment during the development of China's water resources. It will publish books and journals on hydraulic and environmental engineering and sponsor academic forums. According to the newly established society, China has built more than 86,000 reservoirs and 47 million hectares of farmland are under irrigation. Hydroelectric power generating capacity exceeds 20 million kilowatts. Chen Dongming, director of the office of environmental protection under the Ministry of Water Conservancy, was elected president of the society. [OW121105 Beijing XINHUA in English 0732 GMT 12 Nov 81 OW]

JILIN ENVIRONMENTAL POLLUTION--Jilin Province scored achievements in protecting the environment and cleaning up pollution in 1981. Environmental pollution of major rivers, especially the No 2 Songhuajiang River, were improved. Mercury entering rivers declined 80 percent. Phenol and cyanogen declined 60 percent, and organic waste water containing ammonia and nitrates was reduced by 40 percent. Thanks to completion of the first stage of the heating supply project in Changchun, 175 boilers and 107 chimneys were demolished. The annual discharge of sulphur dioxide thus decreased by 600 tons; the amount of dust decreased by 220 tons. [SK042214 Changchun Jilin Provincial Service in Mandarin 1100 GMT 3 Dec 81 SK]

DESULFURIZING AGENT--Beijing, 14 Dec (XINHUA)--The Dalian Institute of Chemical Physics has tested a new coal desulfurizing agent at Hubei Province's Songmuping power plant, according to the Division of Chemistry of the Chinese Academy of Sciences. The pilot experiment reduced the sulfur dioxide content of the plant's smog to less than 0.0003 percent, the division said. The process converts the sulfur, oxygen and water in smog to sulfuric acid, which is of industrial value. The experiment was sponsored by the Chinese Academy of Sciences, the Office of Environmental Protection under the State Council, the Ministry of Power and the Hubei Provincial Scientific and Technological Commission, according to the division, the process has opened new possibilities for the effective and economical use of the 20 percent of China's coal deposits with a sulfur content of 2 percent to 4 percent. [Text] [Beijing XINHUA in English 1339 GMT 14 Dec 81 OW]

CSO: 5000/4016

RELATION BETWEEN POPULATION INCREASE, ENVIRONMENTAL QUALITY DRAWING ATTENTION

Beijing GUANGMING RIBAO in Chinese 11 Sep 81 p 3

[Article by Shang Yichu [1424 2011 0443]: "Population and Environment"]

[Text] At present, one of the problems of the world that worries people the most is the destruction of the environment brought about by the increase in population. This problem has now become the most popular subject in certain realms of environmental science.

The Relationship Between Population Increase and Environmental Quality

Whether it is atmospheric pollution, water pollution or soil pollution, basically, they are all caused by human activity. As people obtain necessities for living, they will more or less unfavorable affect the environment. For example, agricultural production to satisfy the need for food will simplify the ecological system and cause it to become unstable. The need for water, metals and fibers will convert resources into waste. The need for houses and roads will cause the destruction of vegetation and ground surface, etc. Under certain conditions, the total effect upon the environment is directly proportional to the scale of the population.

Of course, there are many factors that affect the environment and the relationships are very complex. For example, the pollution of the environment caused by a city, a region or a factory is related to the unit consumption of resources (food, water, energy, fibers, metals), and the unit consumption of resources is in turn related to the techniques of consumption of the resources. Obviously, at places where it is popular to change resources into waste "in one passing," if recycling technology is used, the consumption of resources can be reduced, and the effects upon the environment can be reduced. But recycling can never be perfect and flawless; there will always be some materials that will be lost and become waste. Also, any recycling technique consumes energy and energy cannot be recycled. In the course of use, waste heat will be produced.

Therefore, the scale of the human population and its rate of increase have an important effect upon the environment. The more people there are, the more needs there will be and the faster the consumption of resources. When the rich mineral resources or nearby mineral resources have been exhausted, people will have to use low grade minerals, increase the depth of drilling and expand the supply network, and all of these activities increase the consumption of unit energy and pollution of the environment. As the needs of the population surpass the capabilities of local supplies, certain renewable resources, such as water, will also lose their renewability. In general, the more people there are, the greater the damage to the environment, and any remedial method can only reduce, not eliminate, the effects upon the environment due to population increases.

Population and Environment in Developing Nations

It is estimated that by the year 2000, even when planned parenthood is implemented, the world's population will still reach 6.1 billion, and the population increases in developing nations will constitute nine tenths of the total world increase.

Most of the developing nations are agricultural nations, and the increase in population frequently will cause overplanting or overdevelopment of livestock, thus causing localized degeneration of the soil and causing the land to become sandy soil. According to estimates by the Food and Agriculture Organization of the United Nations, the increase in the world's livestock has already caused serious destruction of many livestock farms. The entire globe has about 6 million hectares that have turned to desert.

Nomadic planting in developing nations has greatly destroyed forests and vegetation. In Asia alone, there is an agricultural population of 200 million engaged in nomadic planting. Each year, they destroy 8 million hectares of forests to carry out temporary planting. In the future, because of the reduced area of forests and the expansion of settled agriculture, nomadic farmers will be forced more and more to stay and live on the land previously reclaimed and planted. Thus, the resting period of land will unavoidably shorten, causing a reduction in the varieties of colonies of natural plants and animal colonies and a worsening of the soil structure.

Population increase will also intensify the development and utilization of border regions and sub-border regions. When there is a shortage of good land, people will plant on land that easily erodes--on precipitous mountain slopes and red soil in damp and hot zones. Soil erosion results and the productivity of the land drops.

Population and Environment in Industrialized Nations

The effect of population increases upon the environment in industrialized nations is mainly manifested by a daily increase in the utilization of resources and the daily increase in the release of pollutants. The higher the standard of living, the greater the consumption of resources. During the middle 1970s, the population of the United States constituted only 5.5 percent of the world's population, but the consumption of important resources constituted 25 percent to 40 percent of the total consumption of the world. At present, governments of each nation and international organizations have all set the elevation of the people's living standards as the goal of their own struggle. If the living standard of the world population is elevated to the living standard of the people of the United States, then the annual exploitation of iron will increase 75 times, that of copper will increase 100 times, that of aluminum will increase 200 times, that of zinc will increase 75 times, and that of tin will increase 250 times.

Under a situation where control technology is not perfect, the massive consumption of resources signifies ever increasing pollution. Take solid waste as an example. In 1977, the total amount of garbage produced in Japan was 41.26 million tons, equivalent to a daily per capita average of 1,062 grams, an increase of more than onefold over the 500 grams produced per day per person in 1960.

In addition, at present, many regions tend to use new technology that produces even more pollutants. For example, the number of motorized vehicles is increasing daily, detergents are used to replace ordinary soap, cans for drinks and irretrievable containers are used in place of retrievable containers, more and more foods and consumer goods are packaged. Therefore, after the population increases, there will be even more waste entering the environment.

In general, industrialized national produce more pollutants than developing nations. Some people believe, an American pollutes the earth more than 100 Asians. The U.S. population constitutes 6 percent of the world's population but the pollutants released constitute about 40 percent. Modernized agriculture affects the environment even more, for example, the pollutants produced by the current modernized planting method practiced by the 3 million farmers in California are one hundred times the amount of pollutants produced by all the farmers in India. Therefore, under a situation where effective controlling measures cannot be implemented, the population increase in industrialized nations will pollute the environment more seriously than that in developing nations.

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